Beginning: *Distribution Practices in the Field of Construction Materials*

Engineering News-Record

SEP 14 1931

Sand-Asphalt Roads on Cape Cod, Mass.

Welding Reinforcement of Erie Railroad Bridge

Sewer Rate Schedules at Atlantic City

New Delhi—Capital of India

Asphalt-Filled Steel Mesh for Seattle Bridge Deck

Draft Distributors for Hydro-Plant Intakes

Spreading sand-asphalt surface mixture on Cape Cod roads

McGraw-Hill Publishing Company, Inc. September 10, 1931 Twenty-five Cents Five Dollars per Year

Addition to First National Bank Building, *St. Paul, Minn.*

Architects: Graham, Anderson, Probst and White; General Contractor, Paul Steenberg Construction Company
The original building occupies the right-hand portion of the above illustration; the taller structure, at the left, is the addition.

BETHLEHEM STEEL

FRAMEWORK OF BETHLEHEM SECTIONS

Bethlehem Steel Company, General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, Houston, Dallas.

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL OF CIVIL ENGINEERING AND CONSTRUCTION PRACTICE

Volume 107 ✦ A McGraw-Hill Publication—Established 1874 ✦ Number 11

F. E. Schmitt, Editor

SEPTEMBER 10, 1931

Misguided Zeal

THE contention of Governor Ely and his executive council that none but Massachusetts contractors should build Massachusetts roads, regardless of cost to the public, is a bit of misguided zeal. The governor has rejected the bid of a Connecticut contractor for a state highway project on the ground that a local firm must have the job even at a higher figure. Such a stand is unwise and unwarranted. Whatever its intent, it favors a few native citizens at the expense of the entire commonwealth. Unrestricted bidding followed by award of the contract to the lowest competent bidder has long been the basic principle of public-works contracting that protects the best interests of the people. Little would be gained in the end by waiving this principle even in the stress of present times. A community receives definite and certain benefits from highway construction within its borders that are little disturbed by the location of the contractor's home office. Materials will be purchased wherever available for the job; labor that is most suitable will be used; money must be spent by the contractor in that community whether it be his home or not. Federal aid has consistently been denied projects in which free and unrestricted bidding is not observed; and justly so. The possibility of doubling the expense of this project to the state by such withdrawal of government funds will no doubt temper the Governor's desire to favor local contractors. Meanwhile another public project is being held up that should be under way contributing its bit to the relief of unemployment.

Retaliation and Inefficiency

RETALIATION is a powerful and dangerous weapon. Its brutal force will surely be felt by those numerous states that are, under the mistakenly selfish pressure of local interests, attempting to restrict the purchase and use of out-of-state products in an effort to boost home industries. The construction world is feeling this pressure along with every other industry. Such action, even if considered temporarily expedient in the face of a business emergency, is unsound. Our present complex civilization is based on the free and unrestricted exchange of goods. The economic balance of a community can easily be upset by any artificial attempts to disturb free trade. Those states that are urging exclusive home patronage are overlooking possible reprisals by others. Retaliation might easily destroy regional and national markets for the major part of a state's industries because an unwise attempt was made to force exclusive patronage that can support only a few of the industries. But even aside from the danger of reprisals and the need for interstate trade, local labor and materials should be favored only within the range of all-round public interest. When their use involves inefficient, inadequate and unsuited methods and materials, then the economic loss to the community as a whole offsets any possible gain to local interests. States attempting to restrict buying from others are treading on dangerous ground.

Utilizing Local Resources

SKILLFUL engineering more often than not departs from standard types in order to suit the industrial conditions of the problem in hand or to apply local materials. In fact, the degree to which the engineer succeeds in thus utilizing local resources is a fair measure of his ability. Examples in one field are the sand concretes of Kansas and Iowa. Equally in point we have the sand-asphalt roads of Cape Cod, on which Charles S. Hill reports this week. The latter development is noteworthy because of the stability obtained in the road-surfacing mixture despite a low stone ratio. Thorough experimental study of mixtures, and thereafter close laboratory and field control, are obviously vital factors in its success. Costs appear to be high, but since the roads serve a heavy traffic the ultimate judgment on economic value depends on length of life and cheapness of maintenance actually realized over a sufficient period of experience. For the present the Cape Cod practice offers much encouragement to efforts to adapt materials ready to hand even when such adaptation requires special study to work out the necessary changes in method of use.

Volume Charges for Sewers

TO THE average citizen, charges for sewer service are new and strange. They are established in quite a number of cities, however, and are being considered in others. Where the sewers are owned by private companies, as they are in various cities—largely in New Jersey and Texas—sewer charges are of course necessary and long-established practice. Even in public sewer systems there is a tendency toward charging for use. A number of states have passed legislation authorizing charges for the use of public sewers, though few communities have taken advantage of such permission. Where the sewerage system comprises only fixed works—conduits and an outfall—but involves no operating charges, no good reason for service charges can be found, any more than for charges for traversing the public streets. But the rapid spread of sewage-disposal practice, with its large operating expenses, alters the situation. Should these charges be met out of taxes spread over the city by valuation, or should they be paid for on a use basis? This interesting problem, which may soon confront many communities, gives special importance to the practice of the private company which owns and operates the sewers and disposal plant of Atlantic City. Its adoption of a volume basis of charging, computed from water consumption, is highly sug-

gestive. Those who have direct concern with the subject will find it helpful, after noting the Atlantic City facts, to refer back also to the classic report of F. Herbert Snow on sewer assessments at Brockton, Mass., nearly forty years ago. His analysis, and his conclusions favoring a joint service and use charge, still represent the most valuable contribution to the subject available.

11 Million Bid, 8 Million Asked

ILLINOIS is confronted with the strange paradox of trying to raise $8,000,000 for unemployment relief while highway work totaling $11,000,000 is being delayed again and again by a prevailing wage law. A taxpayer's suit to determine the constitutionality of the wage act threatens to prolong the delay caused by labor interests ever since the law became effective. Organized labor apparently thinks the wage act was passed for its own special benefit. Union leaders from Chicago blocked an agreement on wage rates, that was satisfactory to all directly concerned, on projects in the southern part of the state. Retaliatory measures on the part of southern-district labor, in the form of protests against waste of public funds by paying high union scales in metropolitan Chicago, were a logical result. Illinois will find little response to an $8,000,000 charity appeal as long as selfish labor interests succeed in blocking an $11,000,000 road construction program that must soon be under way if it is to be done this season. Through these delays the outlook for employment is made distinctly worse, and the winter problem both in the state at large and in the Chicago district will be hard to deal with.

Embryo Engineers

HEADS of the engineering departments of our colleges and universities are considering what effect the depression will have upon the numbers of new and returning students in their schools. A few schools are assured of more than a normal number of students; others fear a pronounced falling off because the parents of intending students cannot afford the expense. If last year's experience can be used as a criterion there will be a large enrollment this fall, notably of special and graduate students. No figures are available for the year 1929-30, but 1930-31 shows an increase of more than 10,000 undergraduates over 1927-28, which is beyond the normal rate of increase for the two preceding years. Special students, on the other hand, increased from a uniform number of about 850 per year to 2,360. The latter figure seems to indicate that many young graduates unable to find jobs are taking advantage of this time to perfect their education. The same may be expected this year. Such men generally manage to find the necessary money somewhere, and we believe their extra investment pays ample dividends later.

Hydro-Electric Intakes

THE intake stands out as the one major element in hydro-electric power plants that has not been subjected to exhaustive study during the intensive development of water power in recent years. Penstock and turbine-case losses have been reduced to a negligible minimum, runner designs have been perfected by the manufacturers to the point where fractions of one per cent in efficiency are counted, and draft-tube development has been carried to extreme refinement in attempts to get the most out of the turbines. On the other hand, in power plants where thousands of dollars have been spent on elaborate draft-tube refinement, deep eddies and pronounced irregularities of flow in the forebay indicate that avoidable losses of head are occurring there. Other plants are characterized by the high cost of keeping their intakes free of trash and of ice, a cost that might be greatly reduced or eliminated by properly designed intakes. One line of attack upon the intake problem which has been applied at a few power plants is outlined in this issue. It is notable in that the rational application of the fundamental conditions involved to quite diverse channel limitations has proved successful in each instance. Similar studies of plants with less difficult intake problems to meet should show corresponding improvements.

Local Engineering Opportunity

LOCAL engineering spirit faces an unprecedented opportunity. At a critical time it is in a position to render vitally important service to the community by promoting the public-works operations which are needed to take care of next winter's emergency conditions.

All over the country forward-looking cities and towns, states and counties are preparing to meet the problems of the winter season. They know that so many are now unemployed, and that wage income has been cut off for so long a time, as to make widespread distress probable. Even while they are organizing charity measures as a last resort, the public officials realize that the greatest hope lies in providing employment by public-improvement work undertaken on a large scale. To carry through the huge task of planning this work by means of the regular governmental engineering organizations is impossible. But with the active assistance and participation of the organized engineering groups of the community it can be accomplished.

The facts of the situation are simple. Two or three times the normal amount of public work—in some instances perhaps even more—will have to be done during the next eight months if all the idle are to be given employment. This does not mean merely fair-weather work; on the contrary, the highest working rate must be maintained in midwinter, when conditions are least favorable for construction, and some kinds of work are impossible. Many otherwise desirable improvements are therefore unavailable, and to make up the large total required it is necessary to locate and plan all possible improvements suitable for winter execution. No city or county is capable of doing this extraordinary volume of planning with its official engineering staff; however able the staff, it cannot do the work of years in a few months. Nor can the emergency relief organizations that are now being set up here and there accomplish the task, handicapped as they are by lack of the necessary knowledge and skill.

Vigorous action by the local engineering society or group alone is capable of meeting the situation. Its members are thoroughly equipped with knowledge and skill to do the planning. It can undertake for the city the work of reconnaissance, survey and design, outline the methods of organizing and manning the work, and at a later date provide the necessary operating supervision. It can find and analyze the scores of useful but commonly neglected jobs suited to the present need: the road shoulder and ditch reconstruction, the street repair and cleanup work, public building maintenance, and other

items helpful alike to the community and to the seekers for work.

In many cases, no doubt, the group itself can assist in financing the engineering parties in field and office. And by utilizing its own unemployed members for the service it will be doubly helpful, since it will remove them from the list of potential candidates for relief.

There is no longer question that the present emergency is national in character and depends on the strength of national resources for its relief. To date, however, the chief efforts have been local, and no national plan for meeting the problem by public works has been initiated. The executive department remains inactive, and Congress has not been called together to take direction of the crisis. We are drifting on into stormy weather, and the only present certainty is that local construction is our strongest anchor.

It may be that before winter a centralized national control of relief public-works activities will be instituted; or it may be that local efforts must continue to serve without help from Congress or the President. Whatever the outcome, the assistance of local engineering groups is equally vital to the result. Without their help, public-improvement work can provide little more than sporadic, fragmentary relief. With their help, the communities can do away with most of the enforced idleness that now threatens to bring upon us a winter of distress.

Gas Tax Effects

ARE gasoline taxes beginning to exert a prohibitory effect on motor transportation? Some have claimed to observe this effect, and in view of the steady rise of these taxes the probability is coming constantly nearer. The National Industrial Conference Board, after a review of the statistics, reports that gasoline taxes have checked the rate of increase of gasoline consumption despite the fall in prices. It adds, "Had motor fuel prices been rising instead of falling in the past the high tax might have had serious effects on the development of motor transportation." It reports that the tax averages 23 per cent of the price; this ratio probably has rarely been equaled except where restriction was sought, as in liquor and tobacco.

In addition, the board's statistics emphasize the well-known trend toward diversion of the tax revenue away from road use. While on the one hand the exemption of gasoline for farm or motorboat use definitely characterizes the gasoline tax as a road maintenance measure, the diversion of gas tax revenue to the support of schools and other uses indicates the contrary. This serious lack of definite purpose brings out the great instability of the tax. All present signs point to the likelihood of further increase of the tax in many states, although the 7c. level of Florida may not be widely adopted.

The whole situation thoroughly justifies the efforts of road men to combat diversions of the gasoline tax for general expenditure purposes. Once this is done the question of prohibitory effect can be more readily considered. It is therefore encouraging to learn that the Georgia legislature has just killed a bill to divert $5,000,000 of highway funds to the general fund, and simultaneously killed a proposal to raise the 6c. tax to 7c. Such action, taken despite strong support of the bills by the administration, suggests that the worm will turn—the voter will in the end have his rights.

Distribution and Construction

BACK of the arts of the engineer and the constructor, which create each year six to ten billion dollars of new fixed value in the United States, there stands a vast system of production industries from which flow the materials for construction. The powers of construction depend directly on the efficiency of the service which these industries render in placing material in the builder's hands. Their production methods are steadily improved by intense competition, but what of the process by which their product flows to the building site? This latter problem, as surveyed by a competent student, O. F. Rost, is discussed in a group of articles beginning in the present issue.

A hydraulic analogy is helpful in considering this flow of material. In a water system the effect of the pumps at the source is weakened by many resistances in the mains and distributing network through which the water travels to the point of use. Just so, the materials that come from sawmill or pit or kiln are affected by the adequacy or inadequacy of the distribution channels leading to their ultimate destination, the construction job. If these channels are long and tortuous, the materials when received are unduly increased in cost, take excessively long to reach the user, and are rendered less freely available and less desirable. Much of the value implanted in them by the producer's skill and energy is thereby dissipated. In short, the efficiency of production is cut down badly if the distribution is inefficient. The producer is injured, but construction is the ultimate and chief sufferer.

This relationship should be most plainly evident to the engineer, since he is familiar with the laws of flow. But it happens that practical progress in improving distribution processes was first made in decidedly non-engineering fields—in food products, in household articles, in automobiles and refrigerators. Perhaps this is because recently developed products demanded new thinking on distribution if they were to find a market at all, while old materials, as textiles and coal, stuck to the ways of long ago because they felt that their markets were assured. Is tradition similarly controlling in the distribution of construction materials? Is modernization or improvement possible? These are among the questions Mr. Rost undertook to study.

He concludes—if we may anticipate his findings in small measure—that distribution of construction materials is by no means ultramodern. There is much room for improvement. This does not mean that sales effort is insufficient, for, as many of us have had occasion to learn, the selling of construction materials is often as intensive as that of life insurance. But selling and distribution are far from being the same thing. Effective selling may be joined with wretchedly uneconomic distribution practice. On the other hand, efficient distribution inevitably implies or carries with it efficient and economical selling.

A complex mechanism and many basic operating difficulties are involved in distribution. Their fuller study is certain to be of advantage to construction, since such study will tend to make materials more readily and quickly available and lower in price. Even more directly will it profit the producing industries, if we may judge by example: Those materials that have developed the best distribution systems represent profitable industries, while old-time distribution practices usually are accompanied by industrial decay.

First of a Series of Articles on Distribution of Construction Materials

Your Interest in Distribution

O. FRED ROST, whose contributions to the study of distribution have been recognized by prize awards, writes from an experience of more than 25 years in marketing and distribution, covering a wide field—from groceries and food manufacture to railway supplies, automobiles and electrical equipment.

By O. FRED ROST
Marketing Editor, The Business Week, New York

HAND IN HAND with improved production methods and lower prices, modern business has developed improved distribution—shorter and readier paths for the movement of products from producer to consumer. Many of the most striking efficiencies of recent years have resulted from better distribution, notably in the food products field. Can the industries that supply materials to construction improve their distribution methods? Can brick, or lumber, or cement, be made more readily, quickly and cheaply available to the user? These questions were asked of the author, a long-time student of distribution and at present director of distribution surveys for the McGraw-Hill Publishing Co. in addition to his service as marketing editor of *The Business Week*. In response he carried on a thorough study of the current distribution practices of these industries, and he now presents the results in a series of articles. This, the first, article, states the general problem and orients the reader with respect to the succeeding ones. The general finding is that the industries can benefit greatly from overhauling of their distribution systems. —EDITOR.

PREVAILING practices in the production and sale of construction materials such as lumber, lime, brick and cement are so well established and are so much taken as matter of fact in the minds of those engaged in those industries that the important distributive functions through which the industries reach their markets are rarely if ever segregated or analyzed. There has been little or no conscious recognition of the fact that problems of distribution may actually exist. It is therefore probable that economies or efficiencies may be realized, by entering into these problems.

What Is Distribution?

Broadly interpreted, the term "distribution" is applied to those processes and functions that begin when the product of an industry leaves the point of finished production and ends when it is accepted and paid for by the ultimate consumer or user.

It is well to note at the beginning of this discussion that the term distribution is used in both a wide and a narrow sense. In the narrow sense it refers only to the system or mechanism of delivery—that mechanism that moves the goods from producer to consumer, and embraces packaging, factory stocking, loading, shipment, unloading, warehousing, re-treatment or repacking, and final devilery; the jobber-dealer set-up is part of this mechanism, of course. In its broader interpretation, distribution is equivalent to the term selling; it covers not only the mechanism just indicated but takes account also of market determination, sales organization and effort, publicity, price policies and customer service.

For the purposes of the present series of articles it is necessary to deal with elements of both sales work and transfer mechanism. In other words, distribution is to be thought of in its broader sense. Naturally only a few phases of the subject can be considered; full discussion of any of the construction materials industries in respect to marketing and sales would require a large volume.

Obviously the prosperity of an industry is affected by the degree of economy and efficiency with which the various agencies accomplish its distributing functions. Recognition of this fact is usually not attained, however, until competitive conditions have reached critical proportions. Therefore industry as a whole has had its attention focused upon distribution problems only as one branch after the other found that the sellers' market to which it had been accustomed no longer existed and that a buyers' market, such as that in which business finds itself today, demands a different philosophy and a new approach.

Industry was slow to realize that faulty and cumbersome practices, wasteful traditions and expensive habits in connection with the distribution of products could actually constitute one of the underlying causes for unsatisfactory conditions. Even where it was apparent that certain practices needed to be changed the industries concerned often were not willing to initiate reforms until dire necessity and the urge for self-preservation left no other alternative.

Even industries that are exclusively concerned with the manufacture and sale of consumer goods have only in recent years consciously struggled with distribution problems as such, although with them efficiency in distribution is particularly important because distribution costs of consumer goods have a direct and immediate influence on the general cost of living and hence on the buying power of their mass market.

Bringing It to Recognition

Actual recognition of distribution as a separate and distinct problem of business generally is brought about by one or more of the following factors: (1) Entirely new agencies enter the field and become a factor in the distribution of a product. (2) New inventions or developments in the art rise to prominence. (3) Destructive competition sets in as a result of steadily increasing overproduction or excess capacity or as a result of loss of markets to other materials or goods (interindustry competition). One or more of these factors influence the situation of nearly every construction material.

To illustrate the importance of the first factor: In the

food industry the advent of chain stores and their tremendous growth during the last decade focused attention upon the weakness of the previously existing distributing systems. The result was the elimination of many superfluous agencies, unnecessary motions and wasteful duplication. In most lines the spread between cost of finished product and the price paid by the consumer has been narrowed by this improvement; yet the independent distributive agencies of the industry are functioning more profitably, which means more efficiently, than before.

An instance of how the second factor above listed may operate: The arrival of radio and its instant success upset the equilibrium of several important industries. Many piano or phonograph manufacturers failed, and those that survived found it necessary to revise not only their line and their price schedules but also their methods of marketing.

And finally as to overcapacity: The furniture industry expanded its production capacity far beyond what the market could absorb. Of 2,500 manufacturers operating in 1929 more than 500 have failed, and failures are continuing at the rate of two to four per week, while some 200 have been eliminated through mergers. In the retail branch of that industry the number of failures rose from 659 in 1929 to 866 in 1930. Elimination is continuing, but meanwhile those that are surviving are hard at work with the aid of their national associations to devise more effective merchandising methods and set up a more practical and economical distribution structure.

Distribution Wastes Are Large

The retail business of the United States has been variously estimated as involving 45 to 55 billion dollars annually, although preliminary figures obtained from the census of distribution on retail business during 1929 indicate that the total may well go above 60 billions. This, in other words, represents the approximate total of annual sales of consumer goods at retail.

Based on the lower estimates, various agencies have charged that 4 to 5 billion dollars is wasted annually in the distribution of consumer goods. Representatives of the U. S. department of commerce on several occasions have stated that approximately 10 billion dollars of our total retail volume represents waste. Regardless of which may be the more accurate guess, there can be no doubt that a huge amount is paid annually as a tribute to waste. If the ratio of 10 per cent is even remotely approached, it is a critical matter for any industry, no matter what its character.

It is only fair to say that there is much difference of opinion as to just how much of what is now classified as waste in distribution may justly be called such. Some of the items entering into present costs of distribution represent entirely dispensable conveniences and services, which, however, by reason of changes in our mode of living, increases in living standards and other causes, have come to be considered an indispensable component of what the consumer expects in connection with the purchase of a particular commodity. Such wastes should probably not be debited to the distribution practice of the industry concerned, except on a long-time perspective.

In those industries that produce consumer goods recent years have developed clearly a trend toward simplifying, straightening and wherever possible shortening the channels through which products must actually or theoretically travel in order to reach the ultimate consumer.

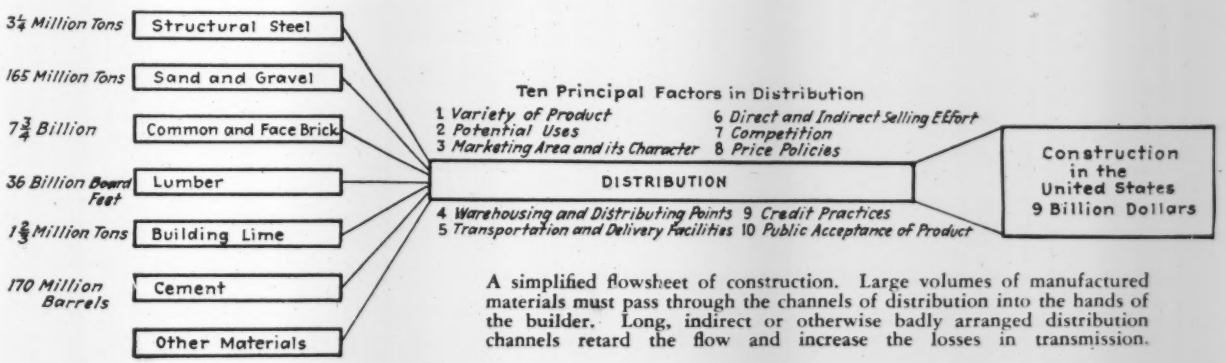
As to Construction Materials

It seems like a far cry from bread to brick, from pianos to gravel, from furniture to cement. Those interested in the manufacture or sale of building and construction materials generally are inclined to believe that their particular industry has nothing, or at least very little, in common with an industry involving consumer goods. Brick, cement, lumber and other building or construction materials are presumed to be in a class by themselves. The general belief is that distribution practices prevailing in those industries cannot be compared with those involving consumer goods, and therefore no benefits can possibly be derived from a more accurate knowledge of just how these latter industries effect the distribution of their products. In fact, many manufacturers of building materials would probably deny that their industry could have problems of distribution; they reason that when business is good they can readily sell their product, and when business is bad it is just naturally bad and very little or nothing can be done about it.

But here is the point: General opinion to the contrary notwithstanding, buyers and sellers of building and construction materials share one fundamental instinct with buyers and sellers of consumer goods. They all are human beings, instinctively observing the first law of nature—self-preservation. It follows that the more human beings are involved in the process of getting any particular product from the point of its finished production to the place where it is ordinarily bought by the final consumer or where it is finally used the more frequently must toll be paid to that first law of nature. Distribution always has its tollgates, and these are points to watch.

Wastes May Be Present

By one estimate, the total volume of building and engineering construction dropped from the 1928 peak of $6,638,000,000 to $4,523,000,000 in 1930. These figures may be only two-thirds the actual total, but their ratio is



A simplified flowsheet of construction. Large volumes of manufactured materials must pass through the channels of distribution into the hands of the builder. Long, indirect or otherwise badly arranged distribution channels retard the flow and increase the losses in transmission.

probably right. It is safe to assume that at least half of those expenditures cover materials of various kinds, manufactured at some point distant from the place of use and therefore demanding a greater or lesser number of the various functions ordinarily considered a part of distribution, before their actual use "on the job" became possible.

If this assumption be sound, it leads to the conclusion that if waste in the distribution of consumer goods, as previously referred to, extracts a toll of 10 per cent even according to the most conservative estimate, a huge sum must also be wasted through uneconomic, impracticable or careless habits in the distribution of building and construction materials. It also justifies the conclusion that since in the field of consumer goods the most complicated and wasteful distribution practices are found in the oldest industries, such as foods and textiles, the distribution system of some branches of the building materials field, being similarly old, may also be found to include some rather antiquated and unnecessarily costly processes. It justifies the further conclusion that if present distribution practices in those industries are studied so as to determine their good and bad features the knowledge thus gained will provide some basis for the development of more efficient and more economical methods of procedures.

Each Step Involves Cost

Without doubt the cost of an item of construction material has become to an increasing extent one of the major deciding factors for or against its use or adoption. Therefore it seems important to segregate and as far as possible determine or appraise the cost of all the functions and processes which directly or indirectly affect that delivered-on-the-job price.

For instance, it would be interesting to know how many times, on the average, bricks are physically handled, moved from one place to another, before they reach their final resting place in the wall, and how each handling affects their final cost. There is also the question of intermediary agencies that only buy and sell the title to construction materials, who actually never see or touch more than perhaps a sample, but who as sales agents, brokers, etc., add a profit for their services and thus increase the final on-the-job price.

Freight, transportation and warehousing costs naturally form an important part of the cost of distribution and have a very definite influence on the relative price at which cement, brick, lumber, etc., may be obtained in various markets. The matter of credit and financing frequently supersedes all other considerations and becomes the deciding factor in the selection of materials and those that will supply them. There is the important question of how much the suitability, uniformity and quality of a particular construction material influence the decision of the engineer, the architect, the ultimate consumer.

And surely it would be desirable to know whether all of the prevailing habitual items of expense affecting the cost of construction material distribution are necessary and which, if any, might be dispensed with.

Distributor's Present Importance

Considering the fact that every industry producing construction materials has been suffering from what some call overproduction but others prefer to define as underconsumption, it is important to know just how the recent scarcity of business has affected the policies and price schedules of various producers.

A study of all the factors that affect the distribution of construction materials was therefore inaugurated by the author at the request of *Engineering News-Record* early in 1930. While the unwillingness of many producers to state facts and figures constituted a distinct handicap and at some points definitely limited the scope of the investigation, the wholehearted cooperation received esewhere has provided ample material for interpretation.

Since distributing practices and procedures differ with the type of material, the presentation of an all-embracing analysis did not seem practicable. Therefore each of the forthcoming series of articles will deal with but one group of materials. Weaknesses and wastes in present distributing systems will be frankly exposed. Wherever specific producers were found to have improved upon prevailing practices or developed a solution to some particular problem, their plan will be explained as completely as possible.

It is hoped that this series will serve to create a clearer understanding of distributive functions and practices in the industries analyzed. Its purpose is to stimulate constructive effort toward their improvement wherever such improvement is desirable.

Rescue of Diver Blown Out of Caisson

FOR THE construction of a wharf in the Thames River at Dagenham, England, steel caissons 12 ft. in diameter were sunk, pumped out and filled with concrete, the steel shell being then taken apart and removed. A diver trying to remove an obstruction to one of these caissons was washed out under the cutting edge. The conditions and rescue methods are described substantially as follows in *The Surveyor* (London):

At 9:30 a.m. on June 19 the diver descended into a caisson, in which the inside water level was 12 ft. higher than the outside level, to remove an obstruction under the cutting edge. He took with him a hose for a high-pressure jet of water to remove the obstruction by the removal of the surrounding mud. He succeeded only too well, for the obstruction (a rock) was not only washed away but created a cavity, which, under the head of water in the caisson, washed the diver under the cutting edge and into the mud surrounding the caisson. That his air pipe did not become severed against the cutting edge was a miracle. He lost his weighted boots, and the air in his suit caused him to be suspended head downward in the mud. [The caisson was 42 ft. deep, with its cutting edge 16 ft. below the surface of the mud and about 30 ft. below the water level of the river. —EDITOR.]

Those on the surface soon divined what had happened and had the wisdom not to attempt to pull the man out by sheer force. Another diver went down immediately and loosened the air pipe under the cutting edge but found it impossible to locate his mate. The weights were removed from the top of the caisson, and various expedients were resorted to in a desperate effort to relieve the weight on the air pipe or to produce a cavity that would enable another diver to follow the air pipe. All to no avail.

Rescue divers then decided upon a search for their mate in the mud outside the caisson, and after some hours succeeded in locating him. They used water jets to blow away the mud, and were thus enabled to locate and slowly lift him. It was found, however, that the available length of air pipe was 2 ft. too short to allow him to be lifted out of the water. After careful preparation he was tied to a crane, and his air pipe was blocked and severed, so that within a few seconds he was hoisted out and found to be alive. It was then 4:30 p.m., exactly seven hours after he had descended. He was only semi-conscious, and his eyelids were blown out with blood pressure owing to his long inverted immersion, but he recovered.

Recent Applications of Draft Distributors to Power Plant Intakes

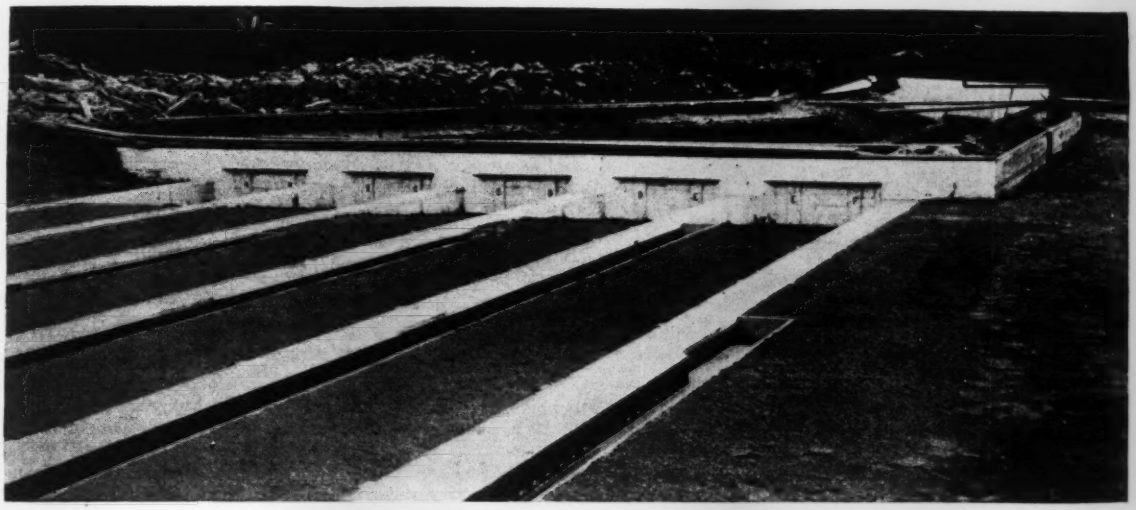


Fig. 1—Model of intake designed for Queenston-Chippawa hydro-electric plant

Rational design of water intakes long neglected—Studies made for Queenston-Chippawa plant in Canada led to development of Johnson-Wahlman draft distributor—Four intakes designed to meet diverse conditions

By H. G. ACRES
Consulting Hydro-Electric Engineer, Niagara Falls, Ont.

WHEN the first successful attempts at high-voltage transmission of electric power were made, about forty years ago, the most obvious and direct reaction was a rapid increase in the development of bulk hydro-electric power and a consequent increase in the dimensions and capacity of prime movers. The further result was a period of progress during which there was a gradual and material increase in the adequacy and efficiency of turbine runner and generator design.

Then followed a period during which the art remained apparently stationary, the reasons being: first, that the potential opportunities for improvement and refinement of design were of the less obvious type, and the investing public had to be educated to appreciate them; and, second, that the engineering profession was not equipped technically to develop these refinements except as a result of a protracted period of original study and experimentation.

The first important development of this latter period was the transition from the cylindrical to the scroll type of turbine casing; then the perfecting of the design of large horizontal water-cooled bearings; then the Johnson penstock valve and the Johnson differential surge tank, which revolutionized contemporary practice in the matter of safely and efficiently controlling long water columns. At about the same time was evolved the oil thrust-bearing and finally the Kingsbury type thrust bearing, which was largely responsible for making mechanically possible the great vertical units of the present day. Finally, there came a protracted and controversial investigation of draft tubes, which culminated in the development of such types as the Moody spreading tube and the White hydraucone.

All of the above developments took place, or were at least well under way, prior to the year 1920, so that over a period of about 30 years all of the essential elements of design, from the draft tube to the generator, had been scientifically developed to a high degree of efficiency, usefulness and dependability, with one important exception.

During the period when these improvements and advances were actively under way no serious attempt was made to rationalize the design of water intakes, the efforts of the designer in this regard being limited to simple arithmetical computations relative to average rack velocities and the fitting of structures of a more or less conventionalized shape as conveniently as possible to local topography.

Early Intake Studies—In 1918, when the Queenston-Chippawa scheme of the Hydro-Electric Power Commission of Ontario had developed into a project of unprecedented magnitude, various problems of design manifested themselves for which there was no reliable guiding precedent, and among the more important of these problems was the intake from the Niagara River. The site chosen for this intake had several important natural advantages that fully vindicated themselves under subsequent operating conditions, but at the time the matter of design was under consideration there were two elements of the problem, which, in view of the magnitude

Fig. 2—Queenston-Chippawa model intake under test

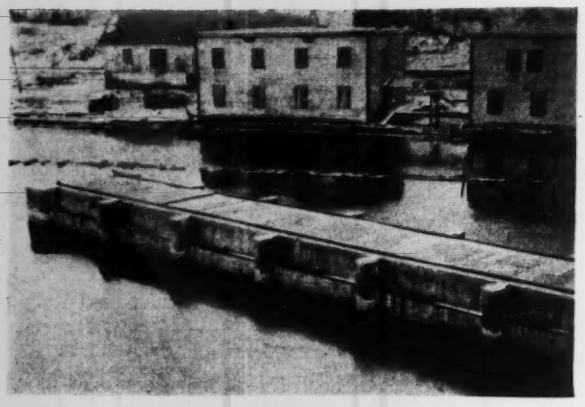


Fig. 3—Intake for the Riordon power plant at Temiskaming, Que., where lateral space was limited

and importance of the project as a whole, justified original investigation through every possible avenue of approach. These elements were: first, the necessity of reducing entry losses to the limit of practicability in order to prevent, as far as possible, the multiplication of head losses in the 12¼ miles of high-velocity open waterway that intervened between the point of intake at Chippawa and the power-house at Queenstown; and second, the prime necessity of preventing the intrusion into this waterway of any part of the huge quantity of Lake Erie ice that passes down the Niagara River in the winter and early spring.

To the above end there was carried out during the summers of 1918 and 1919 a series of large-scale model tests, using water in quantities ranging up to a maximum of 100 sec.-ft. These tests were made under the immediate direction of Prof. R. W. Angus of the faculty of applied science of the University of Toronto. Associated with him was R. D. Johnson, consulting hydraulic engineer of New York City, who had been retained by the commission to advise in the matter of the intake and waterway design.

The experiments made during the summer of 1918, while of considerable interest and value, led to no finally conclusive results; but during the ensuing winter Mr. Johnson, making such use of these experiments as was possible and also of a principle previously put to practicable use by his late partner, Petrus Wahlman, for another purpose, developed an original theory of intake design that was susceptible of rational mathematical analysis. The practicable application of this theory was confirmed by the experimental tests made in the summer of 1919. The original model installation of what is now patented under the name of the Johnson-Wahlman draft-distributor intake is shown in Figs. 1 and 2.

In connection with this study Mr. Johnson enumerated the following fundamental elements of an ideal intake design:

1. Interfere as little as possible with the natural flow of the river; that is, do not divert out of its regular course more water, materially, than the quantity removed through the intake.
2. Actually intercept with the intake structure a much greater width of the river bottom than that which bounds a cross-sectional natural flow equal to the amount to be diverted.
3. Abstract the water to be used from the bottom of the river into subterranean channels where the course of the diverted water may be positively directed and controlled without appreciable influence upon the natural course and flow of the undiverted water.
4. Divert the water evenly; that is, in some definite proportion of the part that is rejected at all points.
5. Keep down the entrance velocity at which the water leaves the river bottom to as low a value as practicably possible, and see that this velocity is less than at any other point in the intake system.

The first two of the above requirements are more or less general in application, and it was with the latter three in particular that Mr. Johnson's theory was con-

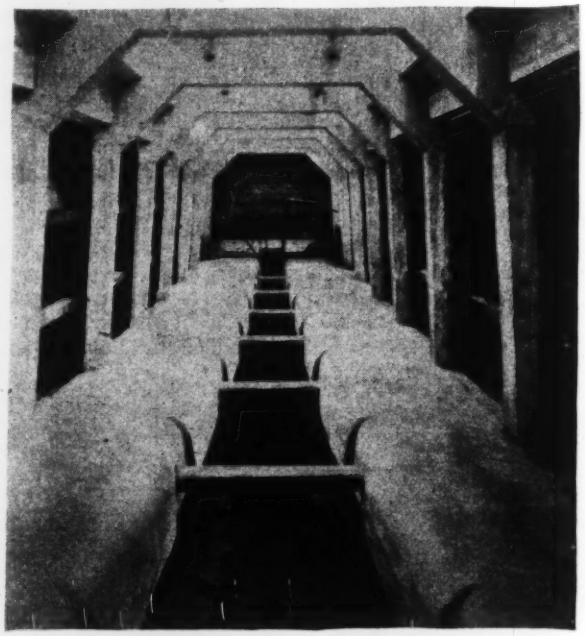


Fig. 4—Interior of the intake at Temiskaming, showing decrease in slot width in the downstream direction

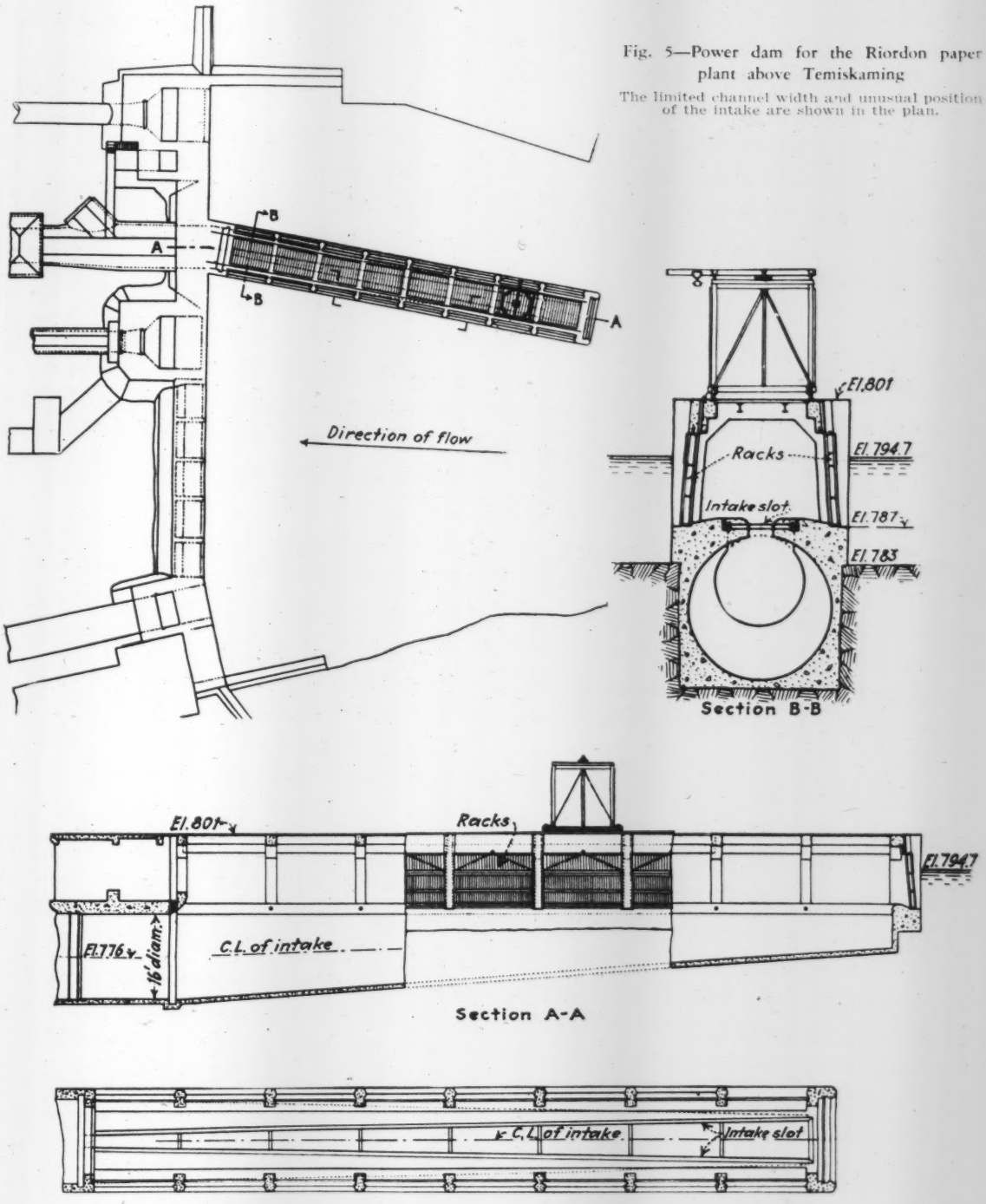


Fig. 5—Power dam for the Riordon paper plant above Temiskaming

The limited channel width and unusual position of the intake are shown in the plan.

cerned. Requirements 3, 4 and 5 are physically illustrated in the test model, Fig. 1. This model employed a series of parallel intake tubes, which constitute the only means of access to the forebay behind the otherwise closed bulkhead seen in the picture. These tubes, later called "gathering tubes," were placed flush with the bottom of the river, as per requirement 3, and the vaned entrance slot shown along the edge of the tube constitutes the element of design that fulfills requirements 4 and 5.

Considering again Fig. 1, it can be conceived that the forebay level at the gathering tube outlets is being gradually lowered, while at the same time the width of the slot in each tube is progressively reduced so as to keep constant the amount of water delivered to the forebay. In the first place it is evident that under such conditions there would be a gradual increase in hydraulic loss, the total of which at any time would be indicated by the difference in level between the water in the river and the water in the forebay. As this difference in level is assumed to be increasing, while at the same time the rate of delivery from the tubes is being kept constant—and therefore also the accumulated friction losses—it follows that the increasing loss accumulation, as indicated by the increasing difference in level, must contain some elements

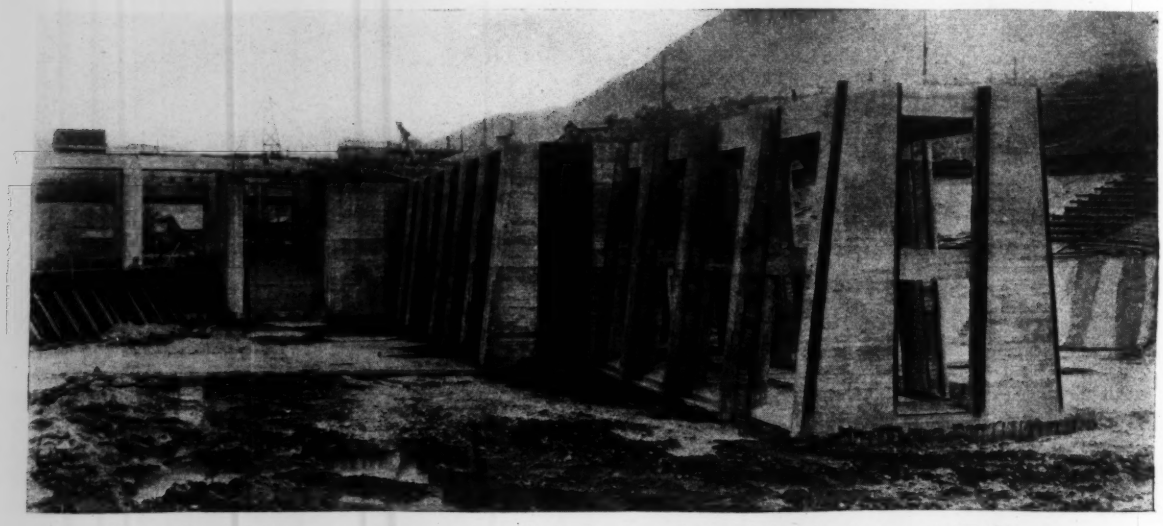


Fig. 6—Parallel intakes extending upstream from the dam of the Chelan development in Washington

other than the so-called friction losses. Obviously, another element of loss arises from the turbulence and distortion that is induced by the impinging of the entering lateral jet upon the main water column in the tube, and which, being inherent in the fluid particles, is independent of such physical properties of fluids as require empirical constants for their mathematical expression. Mr. Johnson calls these "induced" losses, and he defines them through the agency of a rational differential equation based upon Newton's second law of motion.

The mathematical demonstration of this general equation was fully covered in an article by Milton G. Salzman, which appeared in the Dec. 16, 1926, issue of *Engineering News-Record*, p. 998, and it therefore does not need to be repeated. Practically interpreted, this theory furnishes a precise method of designing an intake tube having such a combination of attributes as will make it best suited for the hydraulic service to be performed, and in harmony to the fullest degree with governing topographical conditions. It can be designed with a tapering cross-section and constant axial velocity, or with a uniform cross-section and accelerating axial velocity. Similarly, it can be designed to intake either a constant or a varying quantity of water per unit length of slot, the whole being governed by the varying width of the slot, as finally computed, and by the computed angle of incidence of the lateral jets, as fixed by the designed angle of the vanes relative to the axis of the tube. Furthermore, the diverted flow may be distributed over a multiplicity of tubes in parallel, taking increments of flow equally or in any other proportion, or all of the flow may be diverted through a single tube, these latter

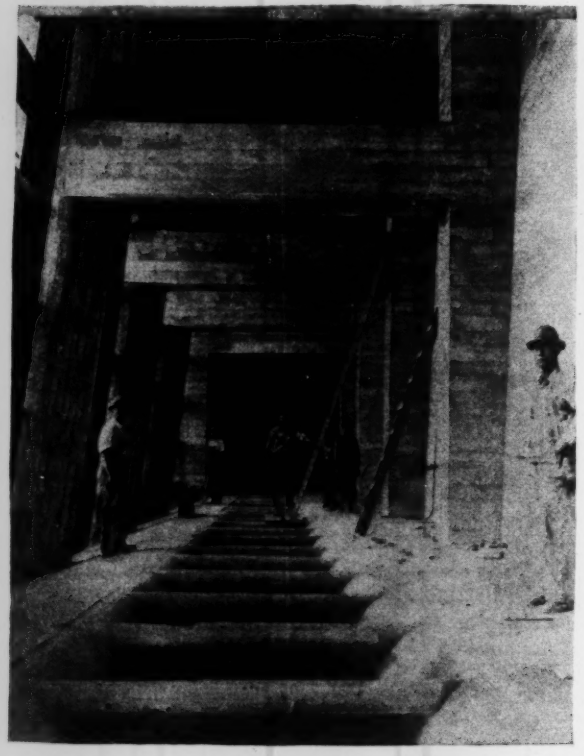


Fig. 7—Interior of the superstructure, Chelan intake
The trash racks are at the left, and the slot to the gathering tube shown in Fig. 8 is in the center.

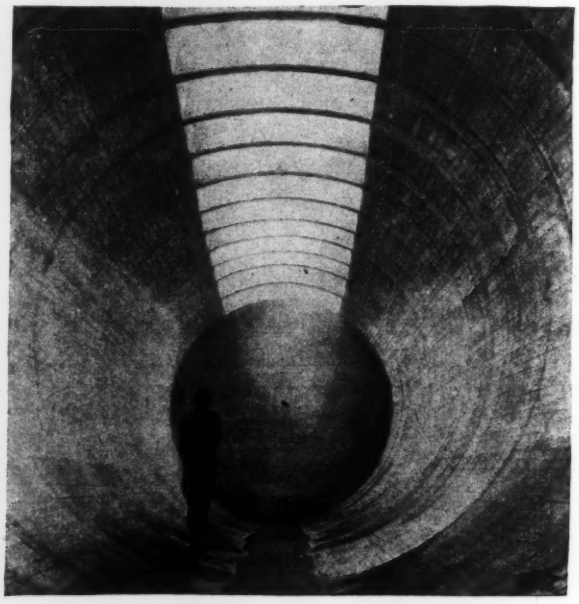


Fig. 8—Interior of the 17-ft. tube, Chelan intake

elements of choice being governed in some measure by the surface transportivity of the source of supply.

Briefly stated, the fundamental advantage derived from Mr. Johnson's demonstration is an accurate, positive and very flexible means of controlling and distributing intake draft, under conditions chosen at will to best suit the conditions of any specific problem.

The Queenston-Chippawa intake, for which this theory was primarily demonstrated, has not yet been constructed as originally designed, since the bulkhead section alone

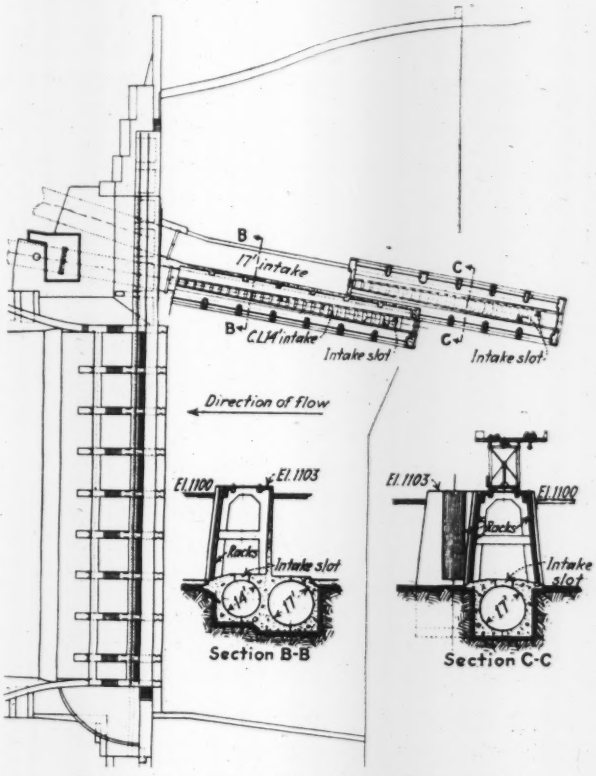


Fig. 9—Plan and sections of the Chelan intake

has so far provided adequately for all operating requirements without the necessity of adding the gathering tubes. Several complete intakes of this type have, however, been subsequently designed and installed by the author's firm under agreement with R. D. Johnson, the patentee, and these structures will be illustrated and described so as to bring out not only the points that exemplify the basic theory but also the remarkable flexibility, efficiency and economy of the design as applied to specific conditions.

Temiskaming Intake—Fig. 3 shows a completed general view of an intake structure built for the Riordon Pulp Corp. at Temiskaming, Que.

The governing conditions in this case were:

1. An existing concrete dam in which there was only about 45 ft. of lateral space available for the insertion of an intake of sufficient capacity to supply 2,500 sec.-ft. to turbines in the powerhouse 1 mile distant.
2. Practically negligible surface transportivity in the head pond and only about 15 ft. of water.

The above conditions made the construction of a workable intake of the conventional type physically impossible within any reasonable limit of cost, but inasmuch as there was no space restriction transverse to the axis of the dam it was possible to build at very reasonable cost the intake structure shown in Figs. 3 and 5. This intake projects upstream at an angle of 80 deg. with the dam to which it is attached, in order to use the bottom contours to best advantage. It has a length of 135 ft. and an out-to-out width of 19 ft. 8 in. The tube itself was designed for uniform axial velocity and tapered from a 10-ft. diameter at the upstream end to a 16-ft. diameter at the point of junction with the dam. The slot was placed along the top of the tube, which was set level and about 7 ft. above the natural bottom of the head pond, thus giving the slot about 8 ft. of submergence.

The point to be particularly noted in connection with Fig. 5 is the fact that racks have been placed across the end and down both sides of the structure, thus making possible very low entrance velocities.

The slot of the Riordon intake and the intake superstructure are shown in Fig. 4 with the racks in place. This view is looking downstream. The slot width decreases gradually, as the view shows, from a maximum at the upstream end to a minimum at the point of junction with the dam. A specially designed priming opening is provided at the upper end to initiate the suction impulse that is necessary in order to make the gathering tube function according to basic theory, and thereafter there is a gradual accumulation of friction and induced losses along the axis of the tube, which in turn produces a gradual increase in difference of "potential" between the source of supply and the water flowing in the tube. The integration of these losses by Mr. Johnson's method furnishes the means of precisely determining the width of slot, per unit length of tube, that will be necessary to allow any predetermined increment of water, per unit of axial length, to be drawn into the tube under the impulse of the actual difference in pressure potential that exists at any point along the tube.

The controlling factor of this design was the lack of any appreciable surface transportivity and the consequent necessity of so adjusting the downward suction impulse as to make it always materially less than the buoyancy impulse of ice, saw-logs and pulpwood. This resulted in such a length of tube and width of slot opening that more than ample rack area was incidentally available, and the precise distribution of draft was a matter of more or less secondary importance. Advantage was taken of this latter fact to save cost by omitting guide vanes and substituting simple cast-iron separators. For the same reason the slot widths were designed in 17-ft. increments with right-angled offsets.

Chelan Intake—The intake of the Chelan development of the Washington Water Power Co., of Spokane, is shown in Fig. 6. While the general scheme of this structure is similar to the one just described, it will be seen to consist of two parallel intakes, the offset superstructure to the left of the picture covering a tube 14 ft. in diameter, and the projecting superstructure to the right a tube 17 ft. in diameter, for the supply of a future 18-ft.-diameter tunnel. This double-barreled structure will ultimately handle 5,000 sec.-ft. of normal maximum supply.

Another point to be noticed is that in this case the slot openings are flush with the forebay bottom and comprise simply an extension of the upstream apron of the dam.

The slot and superstructure of the 14-ft. tube, looking downstream, are shown in Fig. 7, and the interior of the 17-ft. tube, looking upstream, is shown in Fig. 8. Here is seen a slot structure designed for the precise distribution of draft, with guide vanes set at a designed angle and the sides of the slot converging downstream in smooth unbroken lines.

In this case the tubes were designed with a uniform

cross-section for accelerating axial velocity, and the slot widths and vane angles were designed to draw a uniform increment of supply per unit of axial length.

The primary factors governing the design of the Chelan intake were: first, a soft permeable bottom; and second, a shallow source of supply with no effective transportivity. The final justification for its construction was its comparatively low cost.

The general view of this structure indicates that there was no unsurmountable lateral-space restriction involved, but the soft bottom and banks gave rise to a construction and cost hazard that it was unwise to assume in connection with the depth and width of excavation and the subsequent structural support, which would have been associated with building a conventional intake.

As the general view shows, no unsupported excavation was involved beyond that necessary to adjust the general elevation of the forebay bottom to the sill elevation of the sluice gates in the dam, as the narrow trenches excavated below this general elevation were filled with the monolithic concrete of the gathering tubes. At the same time the intake slots have been given a submergence equal to the total depth of water in the forebay, thus tending to offset effectively the disadvantage of deficient surface transportivity.

Also, as will be seen, the 14-ft. tube is provided with racks across the end and along one side, while the 17-ft. tube has racks across the end, along all of one side and along part of the side shown in Fig. 7. Details of the Chelan intake are shown in Fig. 9.

The estimated cost of the draft-distributor intake was only about 55 per cent of the cost of an intake of the ordinary type, as estimated by the Washington Water Power Co., and it was installed complete for less than the estimated figure, inclusive of royalty and design cost.

The Grand Falls Intake—The wharf-like structure shown in Fig. 10 is the draft-distributor intake installed for the St. John River Power Co. at Grand Falls, New Brunswick. This is also a multiple-tube intake, but, unlike Chelan, the two gathering tubes are in line, each tube feeding inward to a common central shaft, which in turn delivers 7,500 sec.-ft. of water to a pressure tunnel 24½ ft. in diameter. The comparative cost economy of this structure was largely due to the fact that it was built before the dam below was closed, so that the intake was built practically in the dry, and no cofferdam and very little pumping were required.

The controlling condition associated with the design of this intake was the large quantity of slush and hard ice that ordinarily passes down the St. John River during the spring break-up. In order that this ice burden might have unimpeded access to the sluice openings of the dam, no consideration could be given to an intake structure extending transversely into the head pond. On this account the design was limited to the consideration of an intake entrance free of the open river channel and with a rack structure parallel to the flow filaments. Associated with this phase of the problem was also the fact that during the freshet period, with the gates open, there would be a fairly high velocity across the face of

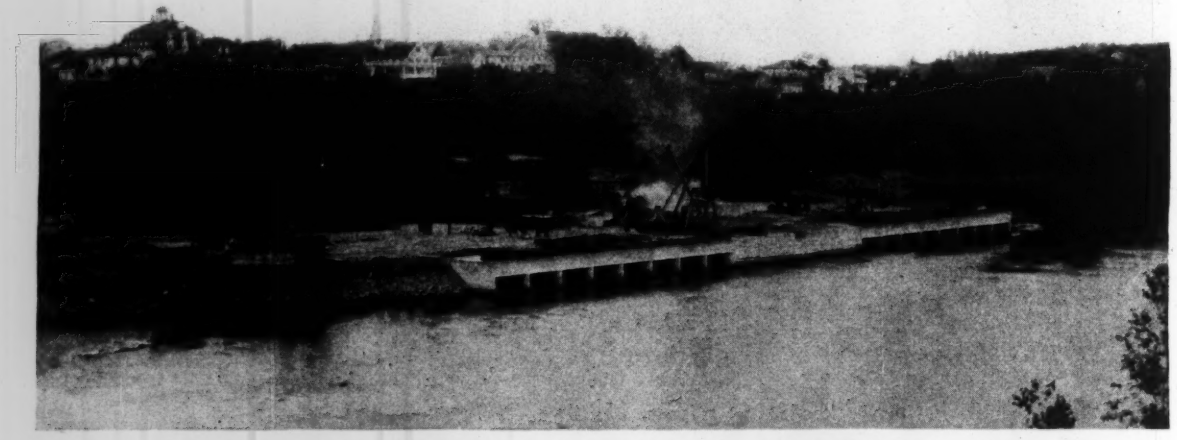


Fig. 10—Intake at Grand Falls, N. B., located at side of channel on account of ice conditions

Fig. 11—Intake slot of one gathering tube at Grand Falls This picture was made before the superstructure was built.

the racks, while during the rest of the year there would be little or no velocity across the racks and therefore no appreciable surface transportivity.

When the source of water supply has an appreciable velocity of its own, as in the case now being considered, any approximation to uniform distribution of diverted flow through the water passages of the conventional type of intake is impossible; and in every such case it will be found that while the average *effective* velocity of entrance may be within the designed limits, there will be regions where the *actual* entrance velocity is so greatly in excess of the assumed average that the structure cannot function according to design. The result is that excessive local velocities are induced, which not only give rise to head losses greater than those calculated from the designed velocity of entrance but which may induce concentrated down-draft impulses sufficiently in excess of the buoyancy impulse of ice and other floating material to destroy the protective function of the curtain wall.

To meet effectively the above disabilities the intake slots at Grand Falls were designed to secure an even distribution of draft through the racks, and the computed guide-vane angles and slot widths were carefully adhered to during construction, the vanes being precast and set in the forms to the angle shown on the plans. Also, in order to secure a maximum of submergence during periods of low or negligible surface transportivity, the slots were offset toward the river instead of being placed on the top of the tubes.

One of the completed gathering tubes, looking toward the central shaft, is shown in Fig. 11. This picture was taken before the superstructure and rack checks were built. As in the case of the Chelan intake, the angular setting of the guide vanes and the smooth converging lines of the sides of the slot are the points to be particularly observed. In this case also the tubes are of constant area, providing for an accelerating velocity toward the central shaft, and the rate of intake per unit of axial length is also made constant. Owing to its location along the shore line the rack structure occupies the river face only of the intake, the rear being carried level into the shore contour by means of a fill.

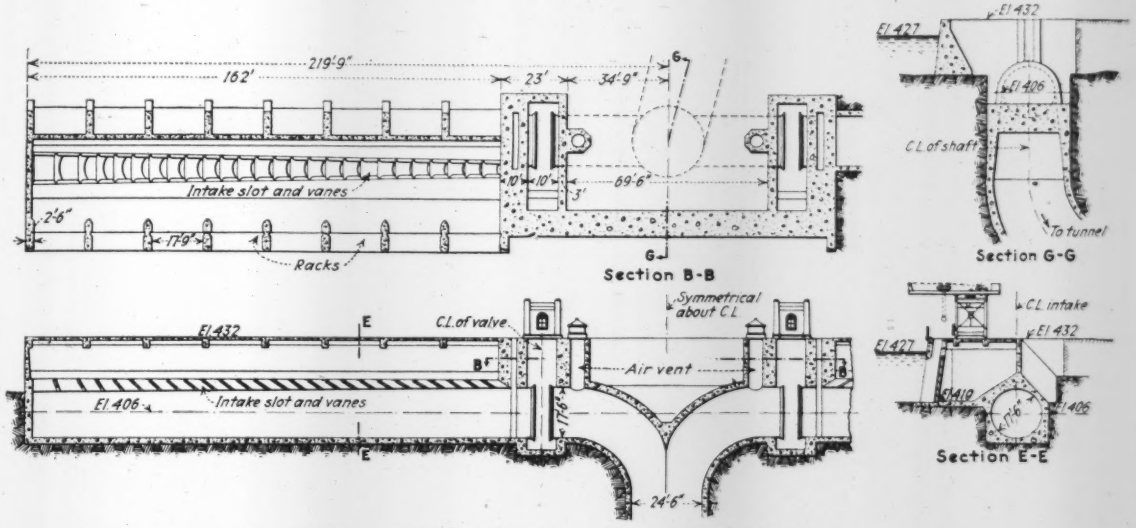


Fig. 12—Details of the intake structure at Grand Falls

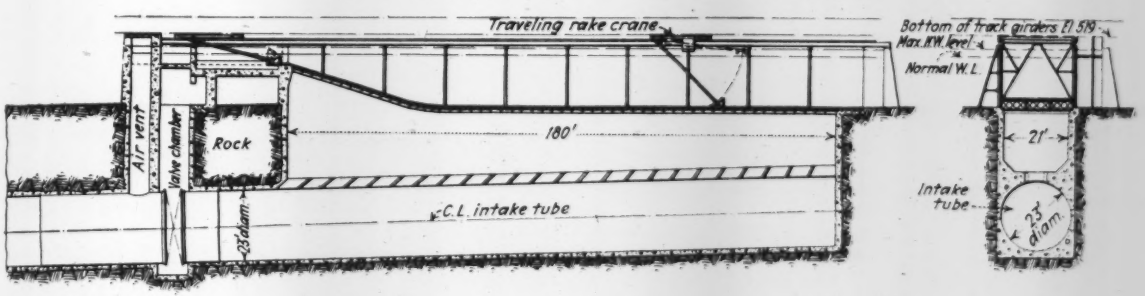
The general layout of the Grand Falls intake is shown in Fig. 12. This plan shows the method of controlling the supply from the tubes by means of butterfly valves installed ahead of the 90-deg. bends, which merge into the vertical central shaft leading to the tunnel.

The longitudinal section shown in Fig. 12 is interesting in that it shows clearly how the angle of the guide vanes is varied in order to maintain, jointly with the varying slot width, the predetermined and designed relationship between the axial velocity in the main water column and the axial component of the entrance velocity of the lateral jets.

A Projected Intake—The salient features of the design of an intake for a projected development that is not yet under way are shown in Fig. 13. This intake is also intended to feed a pressure tunnel, the volume of supply to be 10,000 to 12,000 sec.-ft.

In this instance the only available site for any type of

Fig. 13—Study for intake in an unusually restricted channel



intake is a narrow strip of property immediately alongside and partly under the double-track main line of an important railway system, so that in addition to normally impossible horizontal space limitations, it would be necessary to keep the whole structure below the track level by a substantial margin of vertical clearance. Under such circumstances it would have been physically impossible to construct an intake of the ordinary type, as the lateral space limits are barely sufficient to accommodate the 23-ft. diameter gathering tube shown on the plan. This lateral space limitation is of course responsible for the deep trench in which the tube is placed and for the placing of the racks *horizontally* over the whole length of the opening over the gathering tube.

General Observations—The Queenston intake was designed with *multiple* parallel tubes, projecting toward mid-section of a source of supply having considerable transportivity and *transverse* to the direction of flow. The slots and vane angles were designed so as to make the gathering tube absorb a gradually *decreasing* increment of supply per unit of axial length as the river section became shallower approaching the shore. The axial velocity in each tube was *constant* for the outer 150 ft. and *accelerating* for the rest of the length of the slot, and the slots were on the *downstream side* of the tubes.

The Riordon intake is a *single* tube projecting upstream in mid-section *parallel* to the direction of flow. The increment of absorbed flow is *constant* per unit of axial length, and the flow in the tube is maintained at *constant velocity* throughout its length.

The Chelan intake is of the *multiple* type with tubes parallel, and projecting upstream in mid-section *parallel* to the direction of flow. The increment of absorbed flow is *constant* per unit of axial length, with a *uniformly accelerated* velocity in the tube.

The Grand Falls intake is of the *multiple* type but with tubes *in line* and of opposite sense, instead of parallel, and close along the shore line, instead of in mid-section. Here also the absorbed increment of flow is *constant* per unit of axial length, with a *uniformly accelerated* velocity in the tube.

The above concluding summary is set down for the purpose of emphasizing the very great degree of adaptability which this type of intake possesses as related to local physical conditions, and the many combinations of predetermined elements of design that can be applied to its purely hydraulic functions with a degree of certainty and precision hitherto unattainable. While further improvements and refinements may be expected, the Johnson-Wahlman draft-distributor intake nevertheless constitutes, in its present stage of development, a definite advance in contemporary hydraulic engineering practice.

Rate Schedule of Atlantic City Sewer Company

Privately owned sewer system and publicly owned waterworks with lack of water meters causes flat sewer rates

By C. G. WIGLEY
Consulting Engineer, Atlantic City, N. J.

CHARGES for sewer service made by the company operating the sewerage system of Atlantic City, N. J., are based upon the estimated quantities of sewage contributed by the premises served. The gross income for sewage collection and treatment was fixed by the state public utility commission after submission of evidence as to the necessary operating expenses, a fair return upon the depreciated value of the system and an allowance for depreciation. The gross income was then divided into units that were applied to the number of rooms, number of fixtures, occupational charges and special charges. Sewer charges could not be based on water consumption because not all water services are metered; also the waterworks are owned by the city.

Practically all buildings in Atlantic City are potential hotels or rooming houses, and the number of rooms is a measure of the capacity of the building to provide living quarters for residents or visitors. Experience has demonstrated that as the number of toilets, baths, showers and other plumbing fixtures is increased the water consumption per capita increases likewise, and for this reason the number of fixtures is included in the basis for the rate schedule. The nature of the business carried on will also affect the quantity of sewage discharged. For example, sewage from a restaurant will be greater in volume and more difficult to treat than that from a clothing store. The fourth item, special services, is to represent cost of handling wastes from sources or apparatus not included in the original ordinance. Dish-washing machines, for example, using a large volume of water, have come into use since the original ordinance was passed.

The following charges are for one year, payable in advance, without rebate on account of disconnection or non-use of the property for part of the year.

For each hotel, boarding-house, house, apartment house, boat house, cottage, dwelling, tenement or office building, $1.15 for each room, not counting bath or toilet rooms, pantries, vestibules, closets, heater rooms, laundries or hallways, and an additional charge of $1.10 for each fixture connected with the sewer. The word "fixture" means a bathtub with or without shower attachment, washbasin, toilet, sink, slop hopper, urinal, separate shower or laundry tub. (A two-part tub is considered as one fixture, and each additional laundry tub is classed as one fixture.) Drains other than on fixtures are charged at the following rates: 1½-in. trap, $1.10; 1½- to 4-in. drains, $8.45; 4- to 6-in. drains, $16.90.

In addition to the above room and fixture rates, there is an additional charge of $13.50 for premises occupied as saloons, barrooms and pool rooms.

Stores and general offices are charged $6.75 for each 2,000 sq.ft. of floor area or fraction thereof; private schools having 25 pupils or more, $16.90; banking rooms, $16.90; public bath houses, $1.70 for each ten bath rooms or fraction thereof; bakeries, in addition to store rate for floor space, $20.30; restaurants and cafes, same rate as saloons; steam laundry, $67.60; dairies, $20.30; bottling houses, $42.25; fish and oyster markets, $25.35; churches, $8.45; workshops, $8.45 for each 2,000 sq.ft. or fraction thereof; theaters or music halls, $42.25; ice cream factories, $33.80; piers, $101.40; halls and lodge rooms, $8.45 for each 2,000 sq.ft. of floor area or fraction thereof; soda-water stands and fountains, $3.40 in addition to the store rate; meat markets, $42.25; dish-washing machines, $8.45; dish tubs, $1.70 for each section; drinking fountains, dental fountains and ice-box drains, 85c.; public garages having floor space under 12,000 sq.ft., $59.15, and $5.10 for each 1,000 sq.ft. or fraction thereof over 12,000 sq.ft.; dyeing and cleaning establishments, $19.50; storage houses, $8.45 for each 2,000 sq.ft. or fraction thereof of floor space.

For all other places and fixtures such rates as are agreed upon by the company and lessee or owner of the premises.

The sewage from the city is entirely domestic in character except for small quantities of dyeing and cleaning liquids, as there are no factories discharging manufacturing wastes. The sewage flow varies from 12,000,000 gal. a day in winter to approximately 21 m.g.d. in summer. All of it is pumped and treated.

Reinforcing Main-Line Railway Bridge by Welding

By A. M. KNOWLES
Assistant Engineer of Structures, Erie Railroad Co., Cleveland, Ohio

STRENGTHENING of two deckplate-girder spans on the main line of the Erie Railroad in Akron, Ohio, to carry an equivalent of Cooper's E-73 loading, as compared with their original design for Cooper's E-40 and E-50 loadings, has recently been successfully accomplished by welding reinforcing plates to the flanges of the girders. The elimination of the need for any falsework beneath the bridge, where other railway tracks were located, was one of the principal advantages of the work.

The work was part of an extensive program undertaken during 1930 by the Erie Railroad's department of structures to strengthen many of the bridges between Hornell, N. Y., and Marion, Ohio, to permit the use of new and heavier locomotives. Many of these bridges were of plate-girder construction and were reinforced by cutting out flange rivets in the coverplates, adding additional plates and re-riveting. However, as this work was done under traffic, temporary falsework was required to support the girders while the rivets were cut out, and to support the jacks that were used to secure a proper center camber while the new coverplates were being added. It was also necessary to disturb the track structure to insert the new coverplates on the top flanges, and this work had to be done between train movements. On the Akron bridge, however, the presence of tracks of the Baltimore & Ohio Railroad, of telegraph lines and of the Pennsylvania & Ohio canal under the bridge made it difficult, if not impracticable, to use falsework. The adoption of arc welding proved advantageous, because no falsework was necessary and it was not necessary to disturb the bridge deck or the track.

The bridge is of deck-plate-girder construction, one span 95 ft. and the other 101 ft. long, carrying two tracks on a 4-deg. curve. The 95-ft. span was designed and built in 1903, and the 101-ft. span in 1911, for the equivalent of about Cooper's E-40 and E-50 loadings, respectively; the locomotives to be used at present are the equivalent for these span lengths to about Cooper's E-73 loading. To keep the stresses within safe limits, allowing some increase over normal design stress, there had to be added about 36 sq.in. of metal to each flange of the 1903 span and 22.3 sq.in. to the 1911 span.

The illustrations show where reinforcing material was added between the outstanding legs of the upper and lower angles of each flange on each side of the girders. The short stiffeners between the double-flange angles were cut off, and vertical reinforcing plates were set in outside the heads of rivets and against short liner plates placed at intervals and having holes large enough to go over the rivet heads.

To admit the reinforcing plates on the inside faces of the girder flanges, the gusset plates connecting the intermediate cross-frames to the girder were cut away above and below the frames. The parts of the gussets cut away were replaced and welded to the frames and

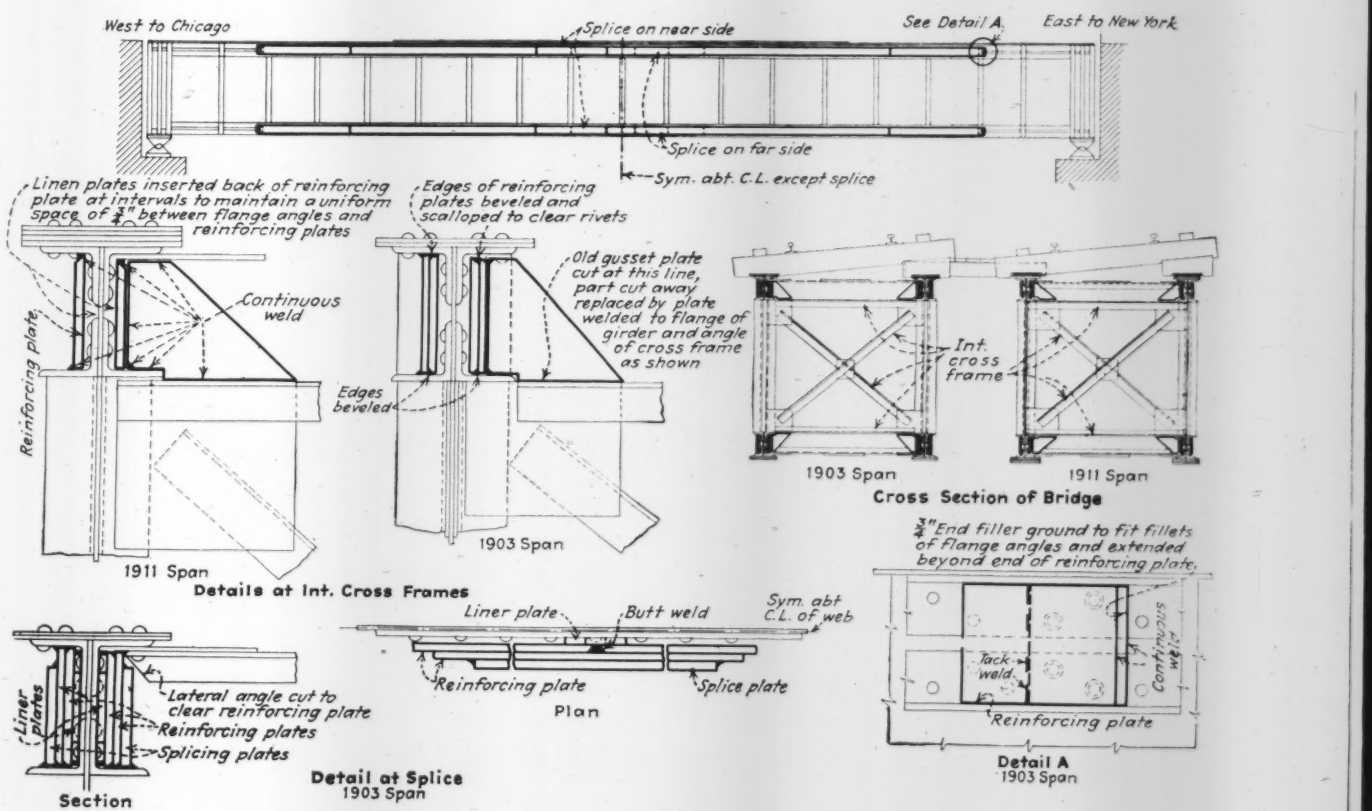

West to Chicago
Splice on near side
See Detail A
East to New York
Splice on far side
Sym. abt. C.L. except splice
Linen plates inserted back of reinforcing plate at intervals to maintain a uniform space of ¾" between flange angles and reinforcing plates
Edges of reinforcing plates beveled and scalloped to clear rivets
Old gusset plate cut at this line, part cut away replaced by plate welded to flange of girder and angle of cross frame as shown
Continuous weld
Reinforcing plate
Edges beveled
Int. cross frame
1903 Span
1911 Span
Cross Section of Bridge
1911 Span
1903 Span
Details at Int. Cross Frames
¾"End filler ground to fit fillets of flange angles and extended beyond end of reinforcing plate
Liner plate
Butt weld
Sym. abt C.L. of web
Tack weld
Continuous weld
Reinforcing plate
Splice plate
Plan
Liner plates
Lateral angle cut to clear reinforcing plate
Reinforcing plates
Splicing plates
Section
Detail at Splice 1903 Span
Reinforcing plate
Detail A 1903 Span

Fig. 1—Structural welding details used in reinforcing Erie Railroad bridge in Akron, Ohio

All welds are continuous and not less than ⅜ in. in size. New material added is shown in heavy lines.

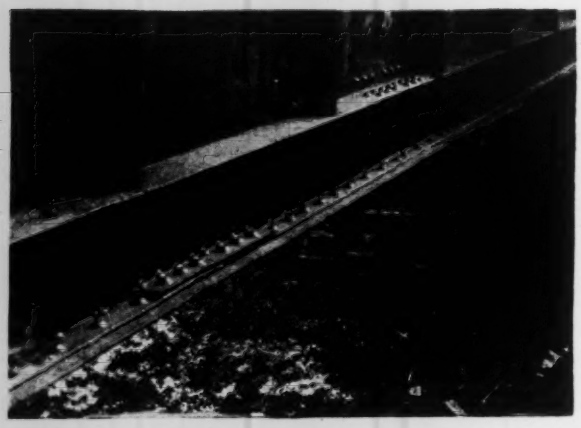


Fig. 2—Welded reinforcing plate along lower flange of 100-ft. plate girder

Plates clear rivets in vertical legs of flange angles by virtue of small filler plates punched to fit over rivet heads.

to the flanges of girders after the side reinforcing plates were in place. With the addition of the reinforcing plates to each side of the girder flanges, the short stiffeners removed were not considered necessary and were not replaced.

The edges of the reinforcing plates adjacent to the coverplated flange angles were scalloped to clear the coverplate rivet heads; and when more than one thickness of reinforcing plate was used, the under plates were beveled along their edges for butt-welding, to permit the next outer plate to be placed in contact with the first plate without riding on the welds of the under plate.

The work was done by the Hallen Welding Service, Inc., Long Island City, N. Y. The contractor provided temporary steel brackets, spot-welded to the stiffeners of the girders for supports of scaffolding along both the upper and lower flanges, as shown in Fig. 3. Between girders, scaffolding was provided on the crossframes and bracing. Two single-operator and one duo-operator gasoline welder of 300-amp. capacity were used. Steel reinforcing plates aggregated 63,000 lb., and 2,460 lb. of $\frac{3}{16}$-in. welding wire was employed. The welders averaged 70 lin.ft. of $\frac{3}{8}$-in. fillet down-welding and 40 lin.ft. of $\frac{3}{8}$-in. fillet overhead-welding per day.

Fig. 3—Reinforcing plate-girder flanges by welding permits uninterrupted train movements by eliminating need for falsework and for disturbing ties and ballast

Falsework was impracticable because of busy tracks and old canal (near left abutment) beneath bridge.

Grade-Crossing Accident Prevention

THE ADOPTION of a uniform program in an attempt to reduce grade-crossing accidents throughout the United States was urged by J. G. Hunter, transportation engineer, California railroad commission, in a paper at the ninth annual conference of state utility commission engineers, Washington, D. C. Mr. Hunter emphasized the need for a national program of grade-crossing protection. The suggested program follows:

1. Jurisdiction over grade crossings should rest with one public body in each state, having authority over both rail and highway traffic and equipped with the necessary trained men to handle the problem in an efficient manner.

2. In order that the problem may be handled in an orderly manner and provide the public with the greatest return for the money spent, a complete survey should be made of all grade crossings.

3. A program should be outlined of grade-crossing elimination by relocation or separation, based upon the available money and in the order of treatment first to the more important and hazardous crossings.

4. Grade crossings should be provided with adequate protection, either manual or automatic. In view of the fact that protected crossings are far in the minority, added protection should first be afforded to the important crossings, especially when the view is obstructed.

5. Crossing signals and markings should be confined to a few standards, preferably one. Such a signal should be distinctive and dependable to operate at all times.

6. Excessive operation of warning signals should be eliminated by the use of proper circuits or controls; otherwise their effectiveness is materially reduced.

7. In all cases an effort should be made to secure an unobstructed view unless prohibited by excessive expense.

8. Flagmen at crossings should be invested with the authority to arrest all persons disregarding stop signals.

9. The creation of new crossings should be avoided.

10. Existing crossings that are not reasonably required by public convenience and necessity should be closed. In some cases crossings can be consolidated, with special protection to the one to remain.

11. Suitable laws should be enacted, regulating speed over crossings and requiring motorists to stop before crossing tracks when a danger signal is displayed indicating the immediate approach of a train, and law-enforcing officers should give as much consideration to the enactment of grade-crossing laws as other highway regulations.

12. Grade-crossing accidents will be reduced to a minimum only when the public does its part in using due care in crossing railroads. A campaign of education and instruction should be conducted in schools, clubs and the home and through all available agencies.

Fig. 1—Grand Court, New Delhi, India

Main administration buildings flank King's Way, extending east to War Memorial. View from viceroy's residence.

New Delhi—Capital City of India, 1931

New seat of government—Begun 1913, opened 1931—Official city founded in open country, but adjacent to ancient commercial city — Monumental structures — City plan, public works and utilities—Comparison with Australia's new capital

EARLY in 1931 India opened and ceremoniously dedicated its new capital city, New Delhi, built in open country in about eighteen years, as the seat of the government of India. The establishment of a new capital or official city was decided upon by the British government some twenty years ago, the general location to be in the neighborhood of the interior city of Delhi. In December, 1911, the first stone was laid, but this was a ceremonial gesture only, the stone being moved later and incorporated in one of the main buildings. In February, 1931, the new city was formally dedicated with the official but rather commonplace name of New Delhi. A view of the Grand Court, Fig. 1, is looking east along the King's Way, at the far end of which is the War Memorial arch. The two flanking structures are the north and south blocks of the secretariat or administration building. At the extreme left is a portion of the colonnade of the circular Council House.

New Delhi and Canberra—In establishing a capital city India has acted contemporaneously with Australia, whose new capital city, Canberra, described in *Engineering News-Record* of Dec. 4, 1930, p. 876, was authorized in 1911, begun in 1921 and opened (though uncompleted) in 1927. In both cases the selected site was in open country, so that city planning was unhampered by existing occupancy. But New Delhi was located adjacent to an existing city and railway center, while Canberra was far removed from any center of population or system of transportation. Again, the Indian capital is a city only, while Canberra, like Washington, includes a federal district. On the other hand, although New Delhi is not yet entirely developed, its main buildings have been erected as designed and constitute permanent and monumental structures. At Canberra, financial conditions in Australia, consequent upon the World War, necessitated the construction of buildings far less costly and elaborate than those originally planned, leaving the latter for some future time.

Site Selection—Formerly the seat of the government of India was at Calcutta, the large commercial city and port on the northeast coast, with the mountain town or resort of Simla as a semi-official seat during the hot season. The ancient city of Delhi, dating from the twelfth century and now also one of the large modern cities of India, is some 850 miles inland and northwest of Calcutta in an almost desert region at about 750 ft. above sea level. Climatic conditions range from 110 deg. F. with low humidity to almost complete saturation at 90 deg. and to a dry cold at 40 deg. A geographical map and location plan are shown in Fig. 2. The centers of the government city and the commercial city are about 2½ miles apart, but their outlying districts are practically in contact and many of the new utilities serve both cities.

Alternative sites were proposed north and south of Delhi, but after sharp competition and controversy the southern site was selected in 1913. This selection was based largely upon sanitary conditions, since the northern site was a low-lying region waterlogged by many years of excessive irrigation, so that filling and drainage at practically prohibitive cost would be required. On the other hand, the southern site was high and well drained. However, its preparation involved heavy work in the removal of small rock hills or buttes and the leveling of great mounds of sand and débris accumulated during centuries of brickmaking. Two of these mounds were 60 to 80 ft. high and covered about 20 acres each. One large hill near the center of the area was retained as a conspicuous site for the main group of government buildings, overlooking both the new and the old cities.

City Planning—Preliminary designs and estimates were made under the direction of Sir T. R. J. Ward. The city plan was prepared by an English committee composed of Capt. Swinton (a former chairman of the London county council); J. A. Brodie, city engineer of Liverpool, and Sir E. L. Lutyens, architect. It had been expected that the city could be built in about five years and at a cost of about $25,000,000, but the World War stopped all proceedings for some years and raised costs

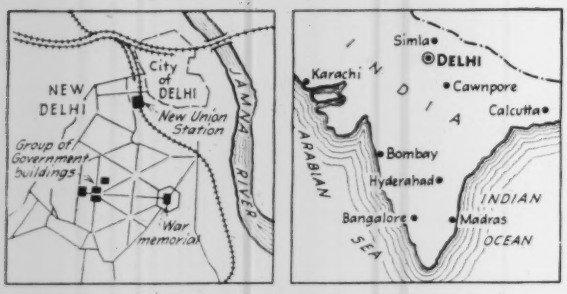


Fig. 2—New capital city of India built on a plain adjacent to ancient Delhi and some 850 miles from the former capital at Calcutta

to such an extent as practically to double the estimate. Given open, unoccupied and practically level country as its groundwork, the committee had a free hand in laying out the plan. Its street layout is a combination of equilateral triangles, with open circular spaces at intersections to provide for rotary movements of traffic and thus simplify traffic control.

The basic feature of the plan, shown in Fig. 3, is the King's Way, a long parked thoroughfare, nearly 1,200 ft. wide between the official residences which front upon it. It lies in an east-west line. The main road from the old city leads to the east end of this King's Way, the entrance to which is marked by the War Memorial, 140 ft. high, with an archway 75 ft. high. At its west end is the Grand Court, flanked by the two secretariat or administration buildings (Figs. 1 and 4) and closed by the residence for the viceroy. To the north of the administration buildings is the Council House, a structure not included in the original plan but made necessary by a change in the system of government a few years ago.

This Council House (Fig. 5), costing $3,750,000 is the seat of the Indian legislature. It is of circular form, 570 ft. in outside diameter, and is divided into three sections, with two chambers for the council of state and the legislative assembly, which are the two houses of the legislature. The third section has the chamber for the Indian princes, who are still autocratic rulers in their own dominions but are under the supervision of the British government. These three chambers seat 200, 400 and 120 persons, respectively, and have auxiliary facilities in the way of clerical offices, committee rooms and private rooms.

Besides these great monumental government structures, the public buildings include an administration office, a hospital, two schools, police and fire departments and miscellaneous buildings. In the residential section there are already more than 4,000 buildings for members of the legislature, officials and clerks, as well as quarters for the native servants. Types of residences for this dry and hot district are shown by Fig. 6.

Building Materials—Native materials of construction

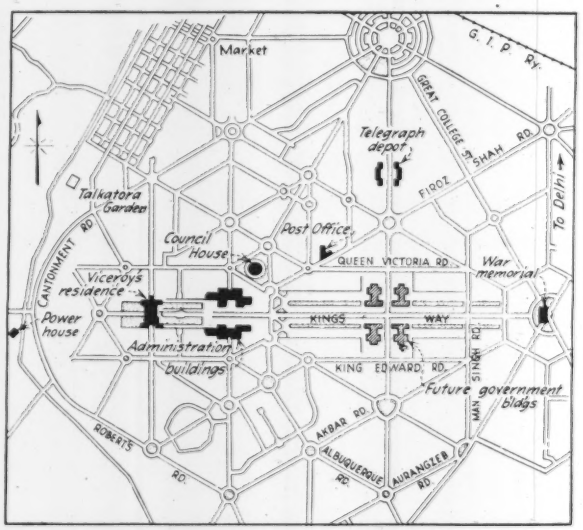


Fig. 3—City plan of New Delhi

were utilized extensively for both economical and sentimental reasons. Sandstone suited for the exterior of the government buildings was available in great variety of color, but the architects selected principally a red stone for the lower portion and a light buff for the upper portion. Unfortunately for rapid progress, the stone varies greatly in quality, the good stone of desired color often occurring in relatively small masses. Thus much time

Fig. 4—Administration building; government of India

This is the north block. It is duplicated on the south side of the Government Court. Note the frequency of water pools in the surrounding gardens here and in Fig. 1.

Fig. 5—Council House; government of India

Contains the two legislative chambers and the assembly hall of the native princes.

was occupied in developing quarries and locating suitable material, so that the construction period was governed largely by the rate at which the stone could be located, produced and dressed.

About 3,000,000 cu.ft. of sandstone in the buildings represents double that amount, or 400,000 tons, quarried and hauled 200 miles to a large stoneyard near the site. For interior work about 100,000 cu.ft. of Indian marble was used. But here also there was trouble, for while marble is found in various colors and of excellent quality, no large quarries had been developed, so that the supply was slow and irregular. Local quartz was used to some extent in massive block and rubble masonry, but was more largely crushed for use as concrete aggregate and road paving material.

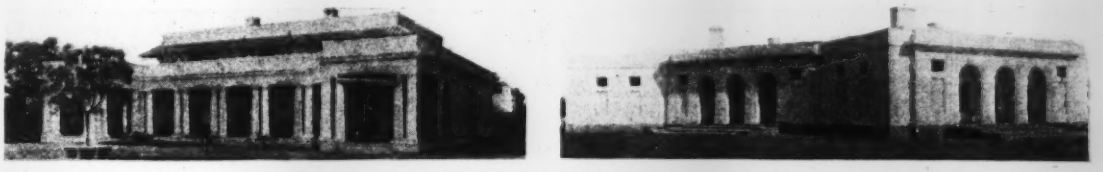


Fig. 6—Typical official residences, New Delhi

For brickwork, local clay was used, and about 700,000,000 bricks were made for the buildings, sewers and other works. They were burned in a plant of 22 circular kilns erected for the purpose. Colored tile was also manufactured. Interior woodwork is principally of teak, but a great variety of other Indian woods was used in the decorative finish and the furniture. Climatic changes, with varying temperatures and humidity, are very severe on such woodwork, and a special kiln was built for seasoning the woods. Beams, signs, fenceposts and rails and numerous other detail parts were made of reinforced concrete. The forms were placed in large tanks (to form pools in the future landscape gardening scheme), so that the concrete could be cured under water.

A construction railway of 30-in. gage, with 60 miles of running track and sidings, removed the excavated material and hauled building materials and the earth for gardens and parkways. There was also several miles of 20-in. portable track. But a large amount of earth excavation and placing was handled in native fashion by coolies carrying the material in baskets on their heads. Building erection was done largely by stiff-leg derricks, including a system much used in England, with a stiff-leg derrick on a triangular platform supported by three tall braced timber towers.

Public Works—A new water-supply system, with intake at the adjacent Jumna River, serves both the new capital city and the old city (see *Engineering News-Record*, May 10, 1923, p. 841). Its filter plant has a capacity of 10,000,000 gal. daily. There is also an unfiltered supply for flushing streets and sprinkling streets and gardens. A sewerage system also serves the two cities and discharges at a sewage farm of 1,600 acres south of the city. The pumping plant at the farm has a capacity of 24,000,000 gal. daily, but its capacity has not yet been utilized owing to the difficulty of eliminating the medieval and objectionable method of nightsoil removal which still prevails in the old city, as in many cities of the Far East.

Surface drainage is designed for a stormwater runoff of $\frac{1}{4}$ in. per hour. Actual runoff is about 1 in. per hour, but part of this is diverted before reaching the city area. Brick lined drains along the roads carry the water to underground drains which discharge into a creek. However, for the central district, the runoff was taken at 1 in. per hour for surface drainage and 4 in. for roof drainage. About 50 miles of main streets and roads and 30 miles of service roads have been built.

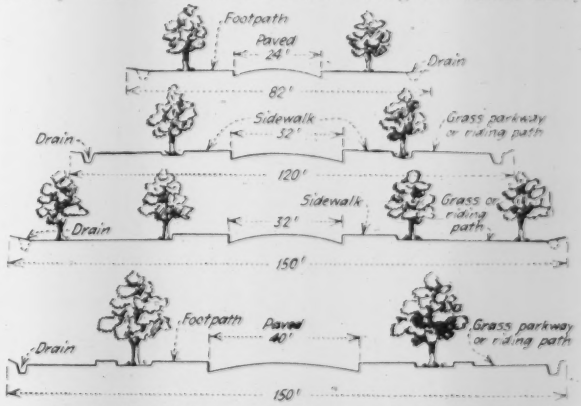


Fig. 7—Typical streets and avenues in New Delhi

These have mainly macadam paving, but the most important thoroughfares are given a bituminous coating in order to reduce the intolerable dust nuisance in this hot and dry district. Thoroughfares range from a minimum 18-ft. paved roadway with 29 ft. on each side for walk, trees and parking, to a maximum 40-ft. roadway in a 150-ft. reservation, as shown in Fig. 7. Landscape gardening has been carried out on a large scale under the horticultural department of the government, which has planted and cultivated a variety of native trees and shrubs. Water areas, formal ponds and fountains are also important features of this development.

Five railway lines of four different systems radiate from Delhi. One line passed diagonally across the selected site for the capital and had to be relocated to pass around it. A union station, which at present has only a temporary structure, will serve both cities. A power station with steam turbine plant of 6,000-kw. capacity serves 85 miles of distribution cables and 130 miles of street lighting. Health and sanitary conditions of the construction forces were so well watched by the government's health department that in spite of the gathering of thousands of natives there was no serious epidemic on the works, except the influenza epidemic which was worldwide in 1918-1919.

Organization—Planning and construction of the new city were under the general direction of a committee representing the government of India, with the minister of public works as president and including also the secretary of the finance department, the secretary of the public works department, the chief commissioner for Delhi and the chief engineer. The chief commissioner had authority to act for the committee in minor matters.

The chief engineer, Sir Alexander Rouse (succeeding Sir Hugh Keeling), represented the government in all technical matters and in this position he dealt directly with the two consulting architects, Sir Edwin Lutyens and Sir Herbert Baker. His department included the following: (1) an architectural bureau for the design of buildings not assigned to the consulting architects and also for all field work; R. T. Russell was chief architect; (2) two construction bureaus, one of which had a special division in charge of the stoneyard; (3) an electrical and mechanical bureau; (4) health engineer and medical officer of health. The six heads of these offices occupied one building for convenience of frequent consultation. They were assisted by a secretary, a quantity surveyor and two financial assistants. In addition, there was a large drawing office, clerical force and blue-printing office.

Railway Difficulties in India

FLOODS on the large rivers of India are a frequent source of trouble to the railways, the flood heights being sufficient to carry away bridge superstructures and breach the long filled approaches, while the riverbeds are scoured out so as to undermine even deep foundations. In the new bridge over the Nerbudda River, on the Great Indian Peninsula Ry. (Fig. 1), truss spans on tall steel piers replace a plate-girder structure with massive masonry piers. At the left of the view is the remaining part of the masonry arch approach structure of the old bridge, which was completely demolished in 1927. On account of frequent destructive floods on one line of the Bombay, Baroda & Central India Ry. and the prohibitive cost of bridges giving adequate flood waterway, some low-level crossings or "dips" have been built, with culverts for ordinary high-water flow and with slopes protected by heavy stone revetment, so that floods may pass over without doing great damage. Traffic will be stopped for a few days but can be resumed as soon as the water lowers to the track level. Landslides are troublesome in the wet and steep slopes of the hill or mountain country. In some cases it is impossible to stop the surface movement, and Fig. 2 shows a masonry covered-way or shed built on the Assam-Bengal Railway to hold the track and protect the trains. The foundations are carried into stable ground and the sloping roof permits the sliding surface to pass over it.

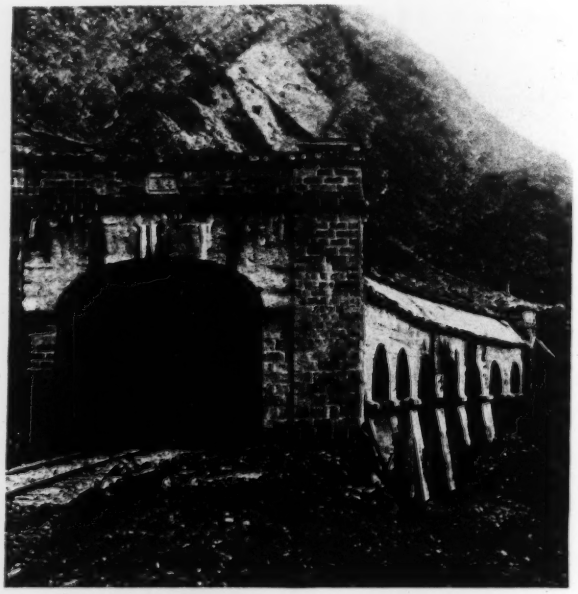


Fig. 2—Landslide shed on the Assam-Bengal Railway

Fig. 1—New bridge over the Nerbudda, India, with masonry approach of old bridge at left

Field Observations on Highway Practices

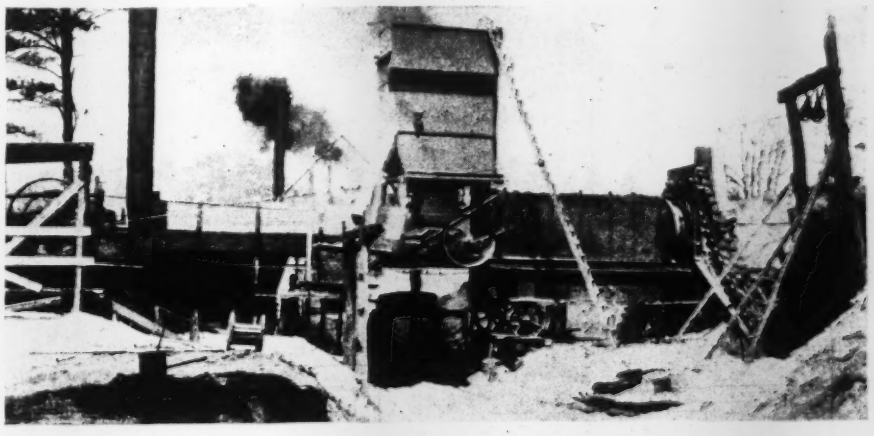
Sand-Asphalt Roads, Cape Cod, Massachusetts

By C. S. HILL
Associate Editor
Engineering News-Record

Half a thousand miles of roads built on mixed local sand and asphalt carry the heavy tourist traffic of the Bay State resort region

A TYPE of bituminous concrete road in which local sand constitutes the bulk of the aggregate has been developed to wide usefulness in the generally sandy soil of Barnstable (Cape Cod) and Plymouth counties and the islands of Marthas Vineyard and Nantucket lying south of Cape Cod. About 500 miles of this type of road is now in operation, of which about 175 miles is state-system highway and the rest township road built under state supervision. These roads are carrying unlimited automobile traffic and a considerable volume of trucking, and in their more recent forms are standing up well under this service.

The present specification and laboratory-controlled bituminous concrete or sand-asphalt road is a product of rather slow evolution. This began in 1905 when a sand subgrade in Eastham on Cape Cod was bladed to shape and given two ¾-gal. applications of 85 per cent asphaltic oil drizzled on by a hogshead-type gravity distributor. The first application was covered with sand and backcovered until bleeding stopped, when the loose sand was swept off and the process repeated for the second application. This construction provided active maintenance and an uneven road—but one vastly superior to loose sand. With modern pressure distribution and a loam-hardened subgrade this construction is still used and is giving a cheap road that costs a lot to keep up and is not very good, but it is mentioned because it gave the first impulse toward the perfection of a local sand and asphalt process that has proven good.



Representative pit asphalt plant for sand-asphalt road construction

The next advance in type was in 1909 to a sand-asphalt mix, a rather crude product but nevertheless a bituminous concrete. Sand from the roadside or near-by pits was hand-mixed in boxes with about 5 per cent of 90-to 100-penetration asphaltic oil and spread on the subgrade in a layer about 4 in. thick before rolling. Compaction was with a hand roller followed by a horse roller, and some time later by a 10-ton three-wheel steam roller. This construction continued until 1913; one road built that year is still carrying state-road traffic; all the others have been resurfaced. A uniform mixture was difficult to secure by hand, and control generally was crude; the results showed up in the road. It is obvious, however, that a type of construction had been created particularly suitable to a sand country, cheaper and better than waterbound macadam, and one that could be improved by refinement.

From 1913 to 1922 was a period of experimentation. Small portable mixers and driers replaced hand-mixing. At first very little attention was given to grading the sand; in general a fairly coarse, clean sand was sought, and that was all the selection exercised. About 1917 some experimenting was done with a cement filler; about 10 per cent by volume was added to the sand. This gave excellent results, but it was considered that the cost was greater than the increased value. About 5 per cent asphalt was used with the plain sand aggregate, and until 1920 the surface was sealed with two ¼-gal. applications of 85 per cent asphaltic oil, each blotted with sand. One-course construction was employed until 1921. The compaction was commonly less than it should be, and this fault with high crowns and narrow pavement resulted in surface inequalities and edge breaks.

In 1922 a purposeful series of experiments to increase stability was begun, and coincidentally the design was changed; the crown was flattened, two-course construction was adopted, the bottom course was made wider than the top course, and the top course was built between side forms. The stability experiments consisted largely of penetration and impact tests of variously graded sands and mixtures of sand with stone screenings and hydrated lime. A tripod penetrator, with a square needle having a cross-section of ½ sq.in., was employed with full regard to load, time, temperature and depth penetrated. The asphalt content of the test mixes varied from 5 to 6½ per cent. This simple experimental work gave the information for a bituminous concrete specification, which with refine-

Spreading sand-asphalt surface mixture

ments now controls all road construction of this type.

Complete specification and laboratory control of the bituminous concrete mixture is exercised. Samples are sent to the laboratory twice a week for complete analysis, and sieve tests of the sand are made repeatedly by the resident engineer in the field. The mixture specified consists of broken-stone screenings and sand in which the screenings must not be less than 30 per cent. The asphalt content is from 5½ to 6½ per cent. Sand therefore constitutes something over 60 per cent of the mixture. Both asphalt and mineral aggregate are closely specified, and particularly the latter, as below. A 60 to 70 penetration of 100 per cent asphalt oil is required.

Screens	Screenings	Sand	Mixture
Per cent passing ½ in.	100	100	100
Per cent passing ½ on ¼ in.	5–20	0–15	4–17
Per cent passing ¼ on No. 10	20–50	0–15	6–26
Per cent passing 10 on 30	20–50	20–75	20–68
Per cent passing 30 on 100	10–45	5–45	7–45
Per cent passing 100	0–15	0–15	0–15

The specification mixtures on road work constructed as described below gave stabilities on actual construction in 1930 of 1,741 to 2,775 lb. per sq.in. with oil contents of 5.91 and 5.41 per cent, respectively. Without further details it is clear that nothing crude or indefinite exists in the control of materials or mixture, while it permits free use of local sands and puts no burden on the modern asphalt plant.

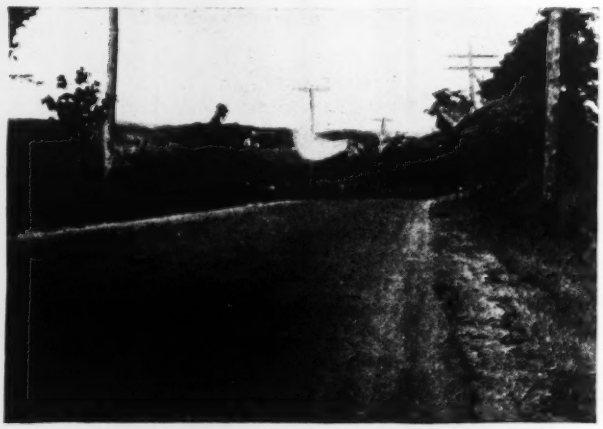
Construction Practice

The state engineering standards for roads of the class being built are followed in sand-asphalt construction. Briefly, the construction is a 4½-in. bituminous slab laid in two courses between side forms on a shaped subgrade and sealed with ¼ gal. per yard of asphalt oil covered with sand. Width, grades, curvature, alignment and drainage are the standards of the class of road being built. In general construction procedure is about as follows: the sand subgrade is consolidated or hardened. From 4 to 6 in. of loam or loam and clay is spread on the sand and is rolled and shaped, partly incorporating with or bonding into the sand until a firm and hard crust is secured. This foundation is naturally flexible, but on confined sand it is exceptionally strong and stable.

The bituminous mixture is prepared in a standard-type asphalt plant. This is generally located at the sand pit, since sand is more than 60 per cent of the weight of the material required. Pit location is determined primarily by the suitability of the sand and its availability in sufficient volume for the work; secondary considerations are central location with respect to the work, length of haul of screenings and asphalt and ease of pit working. Virtually every roadbuilding operation presents a different problem of asphalt-plant location. In general, pit character and quality are controlling considerations.

Hauling either raw materials or the mixed asphalt is not the problem it once was. Modern high-speed trucks make small account of hauls such as occur on road jobs. The specifications require that the mixture shall go onto the road not cooler than 150 deg. Leaving the plant at mixer temperatures over twice as great, the laying temperature required can be maintained, if the trucks are covered, throughout any distance of haul.

At the grade it is the practice to dump the mixture onto dumping boards, requiring it to be entirely rehandled in spreading. The dumping boards are kept on the subgrade ahead of the spreading. Both spreading and raking are carefully controlled, and the rolling is thorough. It is begun as soon as the material is stiff enough to take the roller. For the initial rolling a 6- to 8-ton tandem roller is allowed, but a 10- to 12-ton three-wheel roller is specified for final compression. The rate of rolling is limited to 100 sq.yd. an hour. Final finish is determined by a 10-ft. straight-edge, which must disclose only ¼-in. variation from true plane.



A sand-asphalt road surface in use since 1920

Traffic, Cost and Upkeep

Sand-asphalt roads in the counties being considered are carrying a traffic up to 13,000 vehicles a day. Most of these vehicles are automobiles, but there is a sprinkling of trucks. At the minimum they are heavily traveled roads. The average cost per mile of the state-highway class (24-ft. roadway 4½ in. thick sealed with ¼ gal. of asphaltic oil and sanded) is $21,000 to $24,000. This is foundation and surfacing cost only. The cost of maintenance for a five-year period, including 1930, is as follows:

Year	Miles	Square Yards	Per Mile	Per Sq.Yd.
1926	132.28	1,474,107	$46.81	0.42 c.
1927	141.79	1,595,804	53.88	0.48 c.
1928	157.93	1,847,210	45.68	0.39 c.
1929	172.91	2,091,114	58.05	0.48 c.
1930	169.58	2,083,468	61.70	0.50 c.

The development of bituminous-concrete road construction as described has been under the direction of the Massachusetts department of public works, of which A. W. Dean is chief engineer. The specific information for this article was obtained by an inspection of sand-asphalt road construction and from H. C. Holden, district engineer, whose district includes the territory in which a large part of these roads have been built.

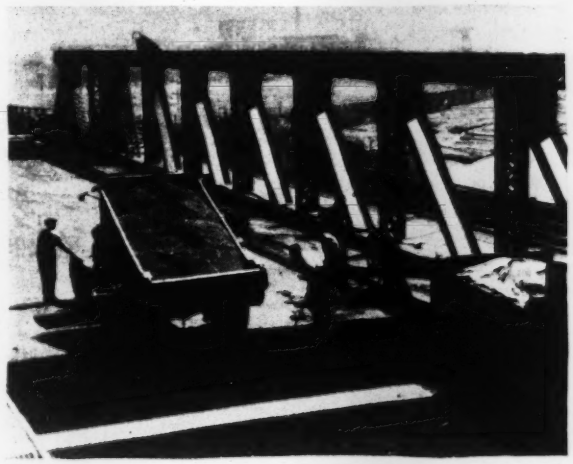
Steel Mesh Filled With Asphalt for Light-Weight Bridge Deck

Construction provides smooth non-skid surface and weight economy for Seattle bascule span

By P. L. PRICE
Chief Engineer, Irving Iron Works Co., New York City

A STEEL MESH of $1\frac{1}{4}\times\frac{3}{16}$-in. bars filled with asphalt comprises the floor of the bascule section of the West Spokane St. bridge in Seattle. This wearing surface laid over treated timber planking provides the weight economy essential to the decking of a movable span. In addition, it produces a smooth wearing surface of non-skid property and low maintenance cost.

The public demand for bridge-surfacing improvement is evidenced by the increasing development of flooring types. Requirements for modern bridge travel include light weight, smooth surface without joints or ridges, non-skidding properties and long life. Maintenance costs and traffic delays must be reduced to a minimum by public demand. The present installation is believed to be a successful step toward solving these problems.



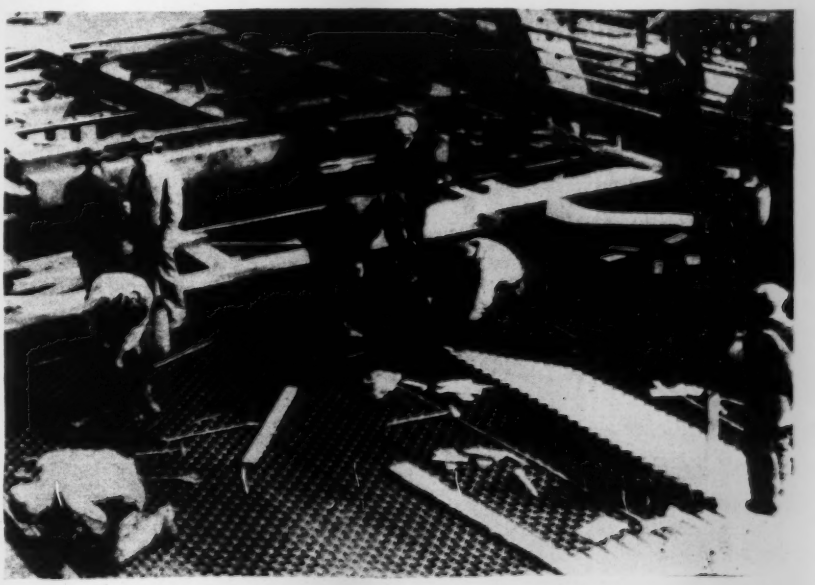
Placing asphalt filler on steel mesh bridge deck
After the usual rolling a heavy truck with solid tires was run over the deck to produce a slight cupping, effective in making a non-skid surface

The steel mesh, which provides the stability and actual wearing surface of this decking, consists of longitudinal $1\frac{1}{4}\times\frac{3}{16}$-in. steel bars fastened together with bars of the same size to form an open-mesh mat. This mat is shop-fabricated in sections by riveting and assembled in the field by means of interlocking splices to form a continuous mesh over the entire area of the bridge deck. The splice eliminates joints and irregularities in the final riding surface.

On the Spokane St. bridge this steel mat was laid on a decking of treated timber plank, separated by a sheet of galvanized iron to prevent possible chemical reaction between the creosote and the asphalt filler. The mesh was fastened to the timber decking by 3-in. drive screws.

In this condition the surfacing was satisfactory to meet traffic requirements, but an asphalt filler was believed warranted to prevent collection of moisture and dirt and to protect the steel. The mesh was therefore filled with sheet asphalt and rolled, as in standard paving practice.

Following the rolling, a loaded truck equipped with wide, solid rubber tires was run back and forth over the deck while the asphalt was still warm. The result was a slight cupping in the meshes, which was beneficial in producing a non-skid surface. The installation was made by the city engineering department of Seattle, under the supervision of C. H. Eldridge, bridge engineer.



Installing steel mesh as Seattle bridge surfacing
Woven into a continuous mat on timber decking, this floor was used on a bascule span.

Passenger-Carrying Cableways

Aerial cableways for the transportation of sightseers to the tops of mountains have been developed to a high degree in Germany, where a Leipzig firm has made a specialty of this form of transportation. The usual cableway consists of two cars that balance each other, each supported by a carrying rope and connected to a continuous-traction cable driven from the upper terminal. There is a tendency to use higher tension in the cables to obviate the effect of sag, which causes undue wear at the supports. Extremely long spans are common, the cableway at Table Mountain, South Africa, extending 3,937 ft. without intermediate support. The use of light metal for car construction has effected a reduction in the average weight of these units to 90 lb. per passenger. Customary speeds are from 980 to 1,000 ft. per minute. Provisions for safety are very rigid, including daily inspection of the cables, an automatic clamp that locks the car to the carrier cable in case of breakage in the traction cable, and a car control that makes it possible to stop at any point without the necessity of notifying the motor operator.

FROM JOB AND OFFICE

Hints That Cut Cost and Time for the Contractor and Engineer

Solar Meridian by Stopwatch

By JAMES GIRAND, JR.
Phoenix, Arizona

THE PROBLEM of determining the true meridian is one that confronts the engineer frequently. Land surveyors use the solar attachment for the transit, and in many cases run lines continuously with the sun as a backsight. When, however, the meridian is only desired to check a traverse, the solar attachment is unwieldy, and a direct observation on the sun is more convenient. The formula most used is

$$\cos \tfrac{1}{2} Z = \sqrt{\frac{\cos S \cos (S - p)}{\cos L \cos h}} \qquad (1)$$

in which L represents latitude of observer; h, altitude of sun; p, polar distance of sun, which is 90 deg. $\pm$ the declination; S, $\frac{1}{2}(L + h + p)$; and Z, azimuth of the sun.

This formula presents no particular difficulties, but it involves considerable work. Four angles must be read on the transit, the declination computed from an ephemeris, the altitude corrected for refraction and five trigonometric functions looked up, in addition to the routine of computation. The average instrument man feels that he is juggling with a handful of figures and he can only hope that the answer will be right.

There is a simple method for determining a meridian, which may be deduced as follows: The basic formulas of spherical trigonometry applicable are:

$$\sin h = \sin D \cos L + \cos D \cos L \cos t \qquad (2)$$

$$\text{and} \quad \sin Z = \frac{\cos D \sin t}{\cos h} \qquad (3)$$

where D = declination and t = hour angle. The significance of the other symbols has already been given. Differentiating (2) with h and t variable, we have:

$$\frac{d}{dt}(\sin h) = \frac{d}{dt}(\sin D \cos L + \cos D \cos L \cos t)$$

$$\cos h \frac{dh}{dt} = 0 - \cos D \cos L \sin t \frac{dt}{dt}$$

$$\frac{dh}{dt} = -\frac{\cos D \sin t}{\cos h} \cos L$$

$$\frac{dh}{dt} = -\sin Z \cos L$$

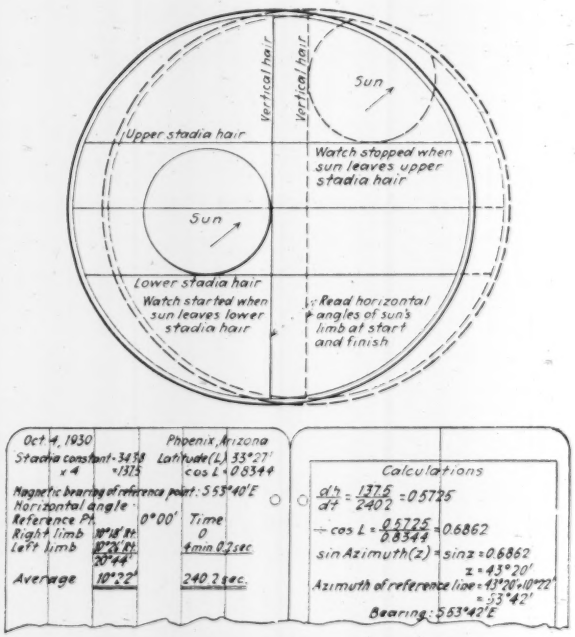
$$\sin Z = -\frac{dh}{dt} \div \cos L \qquad (4)$$

As $\frac{dh}{dt}$ is the rate of change of altitude of the sun, if we can determine this and know the latitude, the azimuth is readily obtained.

It is possible to determine the rate of change of altitude by observing the time required for the sun's disk to cross the horizontal hair of the transit. The better method, however, is to utilize the stadia hairs of the transit and thus eliminate the variable semi-diameter from the calculations. The complete method for taking the observation is illustrated in the accompanying figure and sample notes.

A stopwatch is practically essential for accurate results, although approximate values can be obtained with an ordinary watch. For very accurate work the stadia constant of the instrument should be determined. If the hairs are properly spaced so that the intercept is exactly 1 in 100, then the angle is 34.378 min. The actual constant can be determined by rod readings or by checking back on a known meridian after the observer has gained some proficiency.

The method of observation is to set the transit up and sight some reference point. The telescope is then directed at the sun. If no solar eyepiece is available, the image of the sun may be focused on a page of the field book, which will clearly show the cross-hairs. In the morning, when the altitude is increasing, the telescope is directed so that some of the sun's disk is visible below the lower stadia hair and the vertical motion is clamped. As the sun rises and moves to the right, the vertical hair is kept on the right limb. At the instant the lower limb leaves the lower stadia hair the watch is started and the horizontal angle is read. When the sun is about to leave the upper stadia hair, the vertical hair is put on the left limb, following the sun. At the instant the sun leaves the upper stadia hair the watch is stopped and the second horizontal angle is read. The average of these two horizontal angles is the direction of the sun. The time recorded is the time of transit and the dt of the formula. As the dh and dt must be in the same units, it is con-


Vertical hair
Vertical hair
Sun
Upper stadia hair
Watch stopped when sun leaves upper stadia hair
Sun
Lower stadia hair
Watch started when sun leaves lower stadia hair
Read horizontal angles of sun's limb at start and finish
Oct 4, 1930
Phoenix, Arizona
Stadia constant - 34.38
x 4
=137.5
Latitude (L) 33°27'
cos L = 0.8344
Magnetic bearing of reference point: S 53°40' E
Horizontal angle
Reference Pt. 0°00' Time
Right limb 10°18.5' 0
Left limb 10°26.5' 4 min 0.7 sec
20°44'
Average 10°22' 240.7 sec.
Calculations
dh/dt = 137.5 / 240.7 = 0.5725
- cos L = 0.5725 / 0.8344 = 0.6862
sin Azimuth (z) = sin z = 0.6862
z = 43°20'
Azimuth of reference line = 43°20' + 10°22'
= 53°42'
Bearing: S 53°42' E

Observation and computations for true meridian

venient to multiply the dh by four to convert it from minutes of arc to seconds of time. This is a constant for the instrument and is approximately equal to 137.5 sec. of time. This 137.5 sec., divided by the time of transit in seconds, is the $\frac{dh}{dt}$. This divided by cos L is the sine of the azimuth. A four-place natural sine table will give the angle desired.

For the sake of clearness this explanation has been very long and may lead to doubt as to the brevity of the system. Reference to the notes, which include every detail of the calculation, will show the simplicity and ease of the method. A table of natural sines and cosines is the only reference needed. As in all instrument work, results depend primarily on the skill of the observer, but with a little practice remarkably fast and accurate work can be done. It should be noted that this method is applicable to any heavenly body; a meridian can be determined just as accurately by observing the time of transit of the moon or any star or planet as by observing the sun. Best results are obtained when the object observed is about half way between the horizon and the zenith (the middle of the morning or afternoon for observation on the sun).

Load Test for Steel Bearing Piles

REQUIRED to test the load-carrying capacity of several of the steel bearing piles used as the foundation for a highway grade-crossing separation in California, the contractor solved the problem by jacking down on the

Jack places test load on center pile

center pile against a steel beam clamped to the two outside members of a three-pile bent. The bearing piles in the structure are 8-in. 32-lb. H-sections 45 ft. long, driven to about 35 ft. of penetration. The comparatively small amount of information on the load-carrying capacity of this type of pile resulted in the test requirement. Clamps were bolted to the two outside piles of the bent to support upright yokes that carried a 24-in. steel I-beam spanning the bent with 2 ft. of clearance above the center pile. A 100-ton hydraulic jack was placed between the top of the center pile and the I-beam with the pump and gage carried to the side on a temporary scaffold, as shown in the accompanying illustration. The capacity of the pile tested by this method proved to be 60 tons as against the designed capacity of 30 tons per pile.

The test method was developed by M. B. McGowan, San Francisco, who held the contract for building this structure, which carries a state highway over the tracks of the A.T.&S.F. Railway near Merced, Calif. The overpass was built by the California state highway commission. C. H. Purcell is state highway engineer.

Traveling Cage for Window Washing

By E. W. BURGESS
Construction Engineer, A. O. Smith Corp., Milwaukee, Wis.

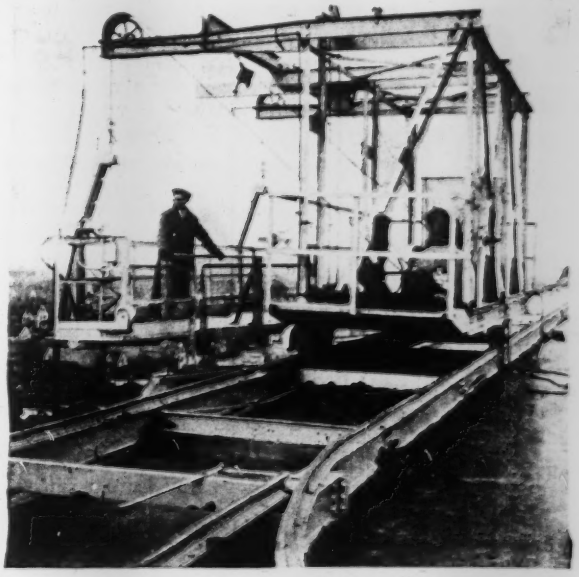
Following publication in the Dec. 4 issue of *Engineering News-Record*, p. 881, of a description of the new A. O. Smith laboratory building, a number of letters were received asking for information concerning the proposed window-washing methods on the building. Among these was one from William H. Adams, consulting engineer, of Detroit, Mich., who stated, in part, "The problem of window washing has proved serious enough with original steel sash with 25 per cent ventilating windows. It would be interesting to know just how they solve it when all glass is fixed. On a building for the Wolverine Brass Mfg. Co. at Grand Rapids projecting brackets from the coping carry a continuous rail extending clear around the building. Suspended from this rail in an iron cage, the operator washes the windows, propelling himself around the building as well as vertically. This arrangement is effective but greatly disfigures the building. It would be possible to design a cornice arrangement which would conceal such a rail. But in this particular case it was a long after-thought." Mr. Burgess' article, which follows, solves the problem of cornice disfigurement by using a track on top of the building instead of a protruding monorail.

—EDITOR.

AMONG the many unique structural and mechanical features of the new engineering and research building built for the A. O. Smith Corp., Milwaukee, Wis., is a traveling elevator to be used for window cleaning and replacement. This building presents 69,000 sq.ft. of exposure to view from the street, 43,300 sq.ft., or 64 per cent, of which is glass. Obviously window washing is a job of considerable magnitude that calls for equipment of the most improved nature.

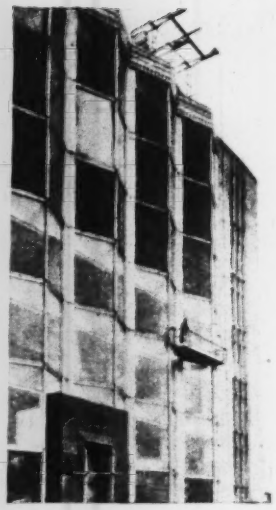
Most standard equipment for window washing is of the suspended monorail type. For a building of this character the cantilever suspension of the monorail was considered objectionable in appearance. In addition, due to the V-bay arrangement of the facade, it was essential that a complete tier of windows be washed from the roof to the ground before proceeding to the next bay.

The machine shown in the accompanying views is



Window-washing cage and roof apparatus

hand propelled along double rails on the roof by means of a chain and sprocket. The cage is suspended by three cables which wind on drums driven by a 6-hp. hoist motor, operating through a gear-type speed reducer. The motor is equipped with an automatic electric brake which serves to hold the cage at any desired elevation after the current has been shut off. The platform of the cage is provided with rubber-tired rollers to protect the aluminum mullions from injury. A clamping device holds the cage to the building, effectively eliminating any tendency to sway in the wind.



Glass walls require a special cage for window washers

Plate glass lights 9x16 ft. on the first floor and 9x13 ft. on the upper floors will be handled from this apparatus to replace any breakage that may occur. The glass is picked up by means of a frame studded with vacuum cups which grip it securely while hoisting into place. A small pump located on the roof and connected to the vacuum cups by a heavy rubber hose produces and maintains a 28-in. vacuum throughout the setting operation. Each vacuum cup is provided with a three-way valve so as to relieve the vacuum in individual cups when removing broken lights. A broken light has been replaced in 35 minutes with this apparatus.

Graphical Analysis of a Dual-Flow Water-Supply System

By GRANT K. PALSGROVE
Professor of Hydraulic Engineering, Rensselaer Polytechnic Institute, Troy, N. Y.

PROBLEMS dealing with the flow of water in a primary water system with two or more supply sources, when attacked analytically, are difficult of solution because of the cumbersome trial-and-error method necessary. Their solution can readily be obtained by the graphical system here outlined, which was recently described in a paper read before the New York State section of the American Water Works Association at Troy, N. Y. Not only does the graphic system lead directly to a definite result, but the curves, when once constructed, can easily be shifted to depict conditions under varying conditions of flow.

Solution of two typical problems will serve to illustrate different methods of approach to the graphical solution. Both cases considered come under the classification "long pipes," in which the lines have a length equal to, or greater than, 1,000 diameters. With such pipes the error involved in neglectng minor losses in valves, bends and other obstructions can be disregarded. The graphic method, however, is even more readily applied to short-pipe problems and leads to a definite result that is particularly difficult to obtain with an analytical solution.

Referring to Fig. 1, the two problems may be stated as follows: (1) Determine flow condition in a gravity-feeder system of three branching mains composed of a supply reservoir A, a distributing reservoir B, and a feeder main with a given pressure head H_3 at point C. Points A, B and C are connected at a common junction Y by pipe lines a, b and c. (2) Analyze the effect of adding a proposed additional source of supply D in order to satisfy an increased demand in the original system. In this case pumping is required, and it is proposed to maintain a pressure equal to H_4 at the pump house and to connect the pumps with the Y junction through a variable-diameter pipe d and d'.

Case I—Since all head loss is chargeable to friction in the pipe lines, this problem will be analyzed by using the equation for friction loss

$$h = f \frac{L}{D} \frac{V^2}{2g}. \qquad (1)$$

Analytical analysis of this problem is difficult because of the fact that the f coefficient is dependent upon the surface of the conduit, the diameter and the velocity of flow. For the graphical analysis an imaginary piezometer tube is erected at the Y junction, and water is assumed to rise to some level in the tube representing equilibrium of flow. Differences in elevation between this level and the water surfaces at A, B and C are denoted h_1, h_2 and h_3. Each of these values represents heads available to produce flow between the Y junction and the point indicated. For this particular case, conditions of flow are assumed to follow the equation:

$$Q_1 = Q_2 + Q_3 \qquad (2)$$

The next step is to assume, within the probable range of the problem, various values of V and to compute corresponding definite values of Q, f and h for each pipe. Results should be tabulated to avoid confusion. Using the values of Q and h thus obtained, curves are plotted in the following manner: Starting from a point O_1 high on the vertical axis, representing the highest water surface in the system, values of Q and h for pipe a

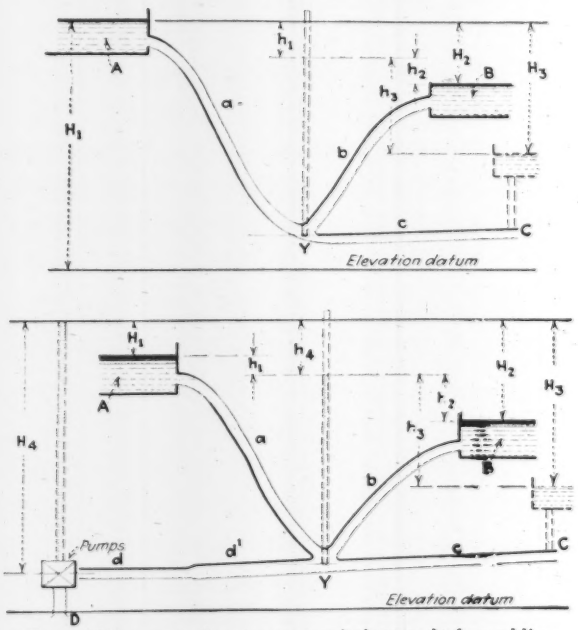


Fig. 1—Diagrams of water system before and after adding pumped supply

are scaled off as abscissas and ordinates to give curve Q_1. This gives flow characteristics through pipe *a*. A similar curve Q_2 is plotted for pipe *b*, using a new origin O_2 vertically below the first at a distance equivalent to H_2. A third curve Q_3 is plotted for pipe *c* with an origin O_3 located a distance H_3 below origin O_1. Graphical addition with a pair of dividers permits the plotting of a new curve, shown as a dotted line on the diagram, which is the summation of curves Q_2 and Q_3. The point where this curve intersects Q_1 satisfies the condition of Equation (2) and establishes a definite value for all quantities and directions of flow in the three pipes. This being known, a hydraulic gradient may be drawn and a study of pressure conditions in the separate parts of the system carried out.

When considering a problem of flow in short pipes all minor losses and velocity heads, expressed as $k\frac{V^2}{2g}$, are simply added to the *h* term of the table for each assumed velocity.

Case II—As a variation, the analysis of this problem will be based upon the use of a Hazen-Williams formula

$$V = Cr^{0.63}s^{0.54}0.001^{-0.04} \qquad (3)$$

This formula has come into general use in waterworks practice and can be solved through the use of the Williams and Hazen hydraulic tables or their special slide rule. Case II has two complications: an additional branch to the system and a compound pipe line. The analysis, while similar to that for Case I, is based on assumed quantities rather than velocities. Corresponding head losses for the several pipe lines making up the system are computed or determined from tables and entered into the several columns of a table. Proceeding further, an equation indicating the direction of flow is assumed, such as

$$Q_4 + Q_1 = Q_2 + Q_3 \qquad (4)$$

Curves for the separate pipes and summation curves are plotted, the intersections determined and the equilibrium point thus found.

Using this general system of solution, there are many variations in the type of problem and method of attack that can be used. Once the principles have been thoroughly grasped, the graphical system of solution can readily be used for any multi-branch or dual-flow system of feeders and their varying conditions.

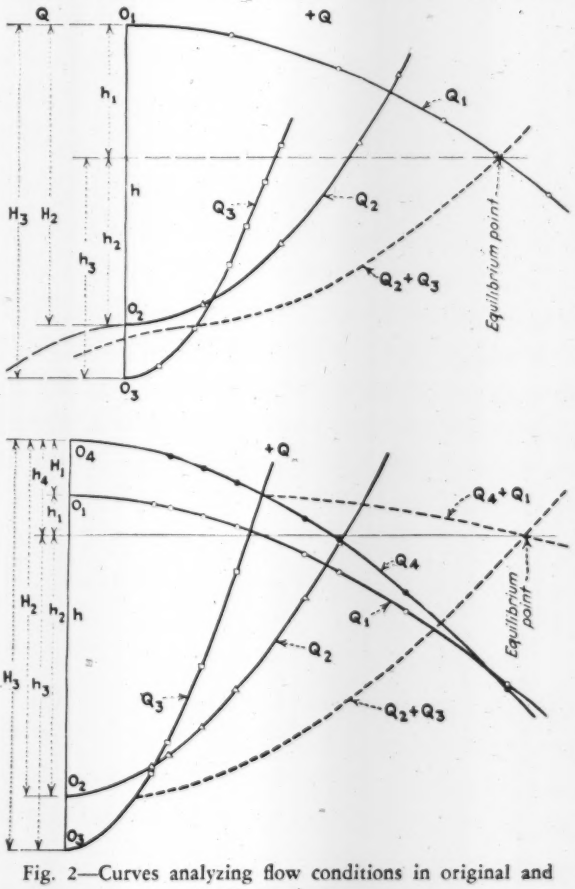
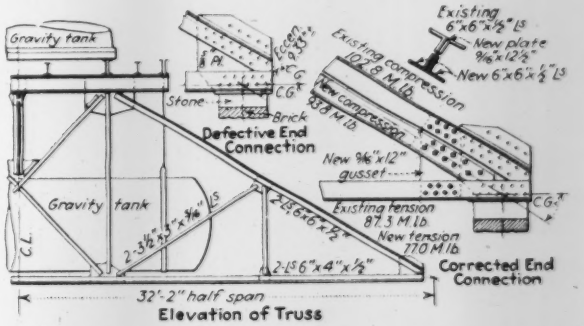


Fig. 2—Curves analyzing flow conditions in original and augmented system

Correcting Eccentric End Connections of Old Trusses

By JAMES K. CAMPBELL
Eadie, Freund & Campbell, Consulting Engineers, New York, N. Y

MANY steel roof trusses have been constructed with eccentric end connections—that is, connections in which lines drawn through the centers of gravity of the



Eccentric end connection of truss corrected by lowering center of gravity of top chord

connecting members do not intersect over the point of support. Snow and wind loads for which these trusses are designed are realized only at long intervals; consequently, such defects in design are seldom brought to notice. The writer has recently assisted in the repair of two trusses used to support a 9,000-gal. pressure tank and a 12,000-gal. gravity tank for automatic sprinkler service. These were located on the roof of a seven-story building, spanning 61 ft. 2 in. between parapet walls. Lines drawn through the center of gravity of the upper and lower chords intersected 19 in. outside the centers of the 1 ft. 4 in. supporting piers. The upper chord of each truss exhibited a marked reverse curve, which shortened its effective length, thereby permitting vertical deflection of the entire truss. Rotation of the end connections also caused slack in the lower chords, permitting further deflection. This deflection produced secondary stress in diagonals bracing the centers of the inclined top chords, adding to the distortion.

As shown in the accompanying drawing, reinforcing pieces were added to the upper chords, so that a line through the center of gravity of the new composite sections intersected the center-of-gravity lines of the lower chords directly over the support. The deflection de-

creased materially when the tanks were drained and was further lessened by the use of temporary bolted clamps to straighten the end sections of the upper chords while the reinforcing pieces were being bolted on. Turned bolts in reamed holes were used to lessen the deflection when the load was reapplied.

The repairs were carried out by Adam Happel Iron Works, New York, under the direction of the writer's firm.

LETTERS TO THE EDITOR

Column Base Slabs

Sir—In *Engineering News-Record* of Aug. 6, 1931, p. 224, appeared a letter by Prof. K. G. Merriam commenting on an article by Prof. G. C. Priester and the writer in regard to steel slabs for column bases published in your March 19, 1931, issue. Prof. Merriam raises the point that a 16x16x½-in. plate as used in some of our tests does not meet a conventional area-thickness ratio, which he claims should be 200 or less. It was evidently overlooked that the test results we reported also included a 1-in. slab.

The A.I.S.C. in its 1930 handbook recommends such slab proportions so that columns over 10 in. will all have slabs of thickness ratios of over 200. An example worked out in this book on p. 438 arrives at a slab that has a ratio of 376. If the same column load and concrete pressure as used in this example are taken, and a slab is designed by the method proposed by Professors Merriam and Downing (see "Design of Steel Column Slabs" published by the A.I.S.C., 1929), the resulting slab is found to have a ratio of 349, which according to Prof. Merriam does not satisfy the fundamental requirement of a column base plate.

The tests reported by Prof. Priester and the writer were only a small part of those made. Tests had been made on ½-, ¾- and 1-in. plates using a round column and 4- and 6-in. H-columns. These tests were made on three different types of foundation bases of different elasticities, including concrete, which of course is the practical case. Further tests of a more comprehensive nature had been planned but had to be dropped as help and funds were not available. We therefore published some of our test results which we thought might be of some help to any one wishing to continue this research to a satisfactory conclusion.

In arriving at a satisfactory design of base slabs the problem we have to solve is to find a method of proportioning the slab so that the distribution of the load under it will be such that the concrete will not fail by crushing. The steel base plate will not fail if on concrete. It should also be realized that the strength of the concrete under the central portion of the slab will withstand much higher stresses than at the edges, where the concrete is less confined.

Because of the present widespread use of steel slab column bases and the divergent methods advanced for their design, it is hoped that tests of a thorough and comprehensive nature will be made in the future to determine a satisfactory design procedure.

C. H. SANDBERG,
Assistant Engineer, Bridge Department,
A. T. & S. F. Ry. Co.

Chicago, Ill.,
Aug. 12, 1931.

American Engineers in Russia

Sir—Mr. Carmody's article on conditions confronting engineers in Russia, on p. 262 of your Aug. 16 issue, is the sanest and soundest opinion on the subject that I have read. I write because other engineers may be interested in knowing that my own experience in building 700 miles of highway in the city and province of Moscow in 1929 and in 1930 corroborates what Mr. Carmody has said. Only in two respects would I amplify his statements:

He speaks of the loyalty and efficiency of interpreters. That many interpreters have both qualities every engineer who has worked in Russia will agree. But we also found that many of them lack knowledge of technical jargon, thereby causing confusion and even accidents. Some, too, prefer to use their own judgment about what is wise to translate or to have unsaid. Engineers need to be very much on their guard in these two respects. Anyone planning to work in Russia would find even a slight study of the language of inestimable value to him.

The one other caution I would give is this: Mr. Carmody speaks of the advantage of working for "competent" American firms having contracts in the U.S.S.R. rather than directly for the Soviet government. With this all the engineers with whom I talked there were in hearty agreement. But I would stress that adjective *competent* that slipped in so easily that a new man might overlook it. There are, unfortunately, in Russia *incompetent* American entrepreneurs with neither ethical standards nor common honesty. They represent capitalism at its worst and make of Americans abroad a byword and reproach. Their workers are permitted to suffer abominably and unnecessarily, and sometimes in the end they are short-changed. An engineer should be absolutely certain that the American firm with whom he signs a contract to work in Russia is of high standing, with the unquestionable purpose of giving both the U.S.S.R. and its own workers a square deal. Only such firms can win the uncertain confidence of the Russians and secure for their workers the satisfaction of doing, despite difficulties, a really good job.

Please accept my congratulations upon publishing an article so just and informative.

H. ELTINGE BREED,
Consulting Engineer.

Cornwall, N. Y.,
Aug. 18, 1931.

Plate Girder Stiffeners

Sir—The article by O. E. Hovey (*ENR*, March 12, p. 446) presented a promising method for spacing stiffeners on plate girder webs. Unfortunately the crippling stresses were based on the solution of the flat plate equations due to Bryan, in which a plate initially flat has its edges fixed in position but free to rotate, the load being applied to the edges as a system of shears in the plane of the plate, it being further assumed that first-order failure will occur. In the case of such a plate, the diagonal in compression takes the form, approximately, of a first-order pin-ended Euler strut on crippling. This, however, is contrary to the results of published tests. Turneaure in 1907 and the University of Illinois in its Bulletin 86, give detailed studies of failure of the greatest value, even though quite limited in scope. Even rolled steel beams, supported at the ends without any lateral restraint, showed stresses in the compression diagonal at crippling 80 to 90 per cent of that corresponding to a first-order fixed-ended Euler strut (3.2 to 3.6 times pin-ended strength); failure occurred in such cases by the bowing of the tension diagonals on buckling, giving rise to a pull component on the ends of the flanges perpendicular to the plane of the web, thereby causing the flanges (laterally unrestrained) to rotate and relieve the tension, precipitating total failure. In the case of fully stiffened girders, the diagonal in compression crippled as a second-order fixed-ended Euler strut at values of stress more than four times those calculated for first-order failure, or sixteen times those to be expected from Bryan's solution. This difference is of importance provided the true crippling stress lies below the yield point of the material.

A plate girder, or even a rolled steel beam without stiffeners, acts as a truss in which the shear members are replaced by a system of diagonal strips in compression and a set substantially perpendicular thereto in tension, deformations being limited by the possible deformations of the stiff frame and the stresses set up in the strips. As Turneure has shown by his measurements of stresses in stiffeners within the working load for the beam, the girder acts substantially as a solid member as long as the diagonals in compression do not cripple. He came to other conclusions through his failure to continue stress measurements to failure and through his failure to recognize the similarity of stiffener stresses on girders to lattice bar stresses in the case of latticed columns. Lattice bars show negligible stresses until more than 75 per cent of the ultimate load is on

the column. For stresses below crippling, the two sets of strips share the shear equally. Above crippling, the shear borne by the compression strips remains substantially constant, while the ratio of tensile stress increment to load increment becomes twice as great as before. At crippling, the girder yields appreciably; at tensile yield, the girder undergoes another yield; ultimate failure occurs by tearing of the tension strips. Any adequate theory of plate girder action must recognize this truss behavior.

The type of diagonal strip failure depends upon the ability of the truss to maintain its initial plane, the ability of the chords to remain untwisted, the strength of the beam to resist lateral buckling as a whole, and the lateral restraint. By treating the compression strip (main diagonal) in succession as a slightly imperfect column of higher and higher orders, we may estimate side deflections under load, and for a given slight deflection estimate the unbalanced side forces. Similarly for the main tension diagonal. If for a given small deflection the restraining force due to the tension member is less than the unbalanced force of the compression member, and remains so for increasing deflections, the order of failure assumed is not attained. The corresponding end moments and rigidity in torsion of the flange may be compared. If the flange cannot balance the moment for such small twists as are possible at failure for a fixed-ended column, pin-ended action will determine failure at the compression flange. The method is an approximation to results obtained by application of the principle of least work in an exact mathematical solution, and is typical of approximate methods for all kinds of stability or buckling problems.

Most plate girders designed by the usual specifications will show diagonal crippling by second-order fixed-ended strut action. If any lateral restraint is available, at least fixed- and pin-ended action will be obtained in the vast majority of cases. For this case it is not necessary to make stress reductions until the ratio of clear web depth to thickness exceeds 63, checking very well the usual ratio of 60 adopted by the A.I.S.C. for use with standard material for which 12,000 is the proper design stress in shear.

Bethlehem, Pa.,
Aug. 16, 1931.

EDWARD ADAMS RICHARDSON.

To Stimulate Public Works

Sir—We are heartily in sympathy with the spirit of your leading editorial, "An Emergency Ahead," in the Aug. 20 issue. If every city official could read a reprint of this editorial some progress might be made in the stimulation of public-works construction as a relief measure.

Throughout Indiana and the Middle West and, we presume, all over the country the tax-reduction movement with a resulting complete curtailment of all public-works construction is gaining tremendous impetus. The spirit of this "crusade" seems to be to carry on all public building during the peaks of the business cycle when costs are high, with a result that the bills, to a large extent, must be paid during the depressions.

EDWIN C. HURD.

Indianapolis, Ind.
Aug. 25, 1931.

Pressure of 45 Lb. in Michigan Wind Storm

Sir—On the night of July 15 a rain and wind storm from the north swept through this locality. The night's rainfall recorded by John Brown, cooperative U. S. Weather Bureau observer at the State Hospital near here, was 1.22 in., the heaviest fall of the year. (It is to be noted that there are now two Weather Bureau stations in or at Newberry. The older one, whose records are to be found in Michigan weather reports for twenty or more years past, is the one referred to above, equipped with maximum and minimum thermometers in cage, aneroid barometer, and standard rain gage. It reports to Grand Rapids. The second station, in Newberry village at the state conservation department headquarters, reports to Chicago. The equipment of the latter place consists of recording electrically connected four-cup Robinson anemometer on a tower, maximum and minimum thermometers, rain gage and hydroscope with psychrometer.)

Locally the damage by the storm was confined principally to trees blown across the state highway and small branches torn from trees. Mr. Brown stated that heavier winds have blown across the state hospital grounds. Be that as it may, I selected a dead branch broken from a poplar on the state hospital grounds, length about 6 ft., diameter about $\frac{3}{4}$ in. at break. This branch I broke again with a known load, the branch being wedged into a pipe so as to break as a cantilever about 3 in. from the wind break. I also rebroke it as a check above this second break. The results follow:

First test break, modulus of rupture 1278.5 lb. per sq.in.
Check test break, modulus of rupture 1257.5 lb. per sq.in.
(Break precipitated by touch of coat or something)
Surface area of whole branch = 146.44 sq.in.
Diametral projection of area 146.44 3.14 = 46.613 sq.in.
Distance from windbreak to centre above areas = 34 in.
Weight of overhanging branch in test = 0.3208 lb.
Arm of above weight (by balance) = 23.5 in.
Total test moment = 318.8 in.-lb.
Total wind load by proportion 9,376 lb.
Unit wind force on diam. projection to produce above wind load = 9,376 × 144 ÷ 46,613 = 29.25 lb. per sq.ft.

That is, a load of 29.25 existed on a cylindrical surface (the branch) at the time of its breaking by the wind.

See Fig. 7B (p. 512) *Scientific Paper* No. 394, U. S. Bureau of Standards, and also various mathematical discussions on air pressures on cylinders and it will be found that this pressure is about two-thirds that on a plate normal to wind. Hence plate pressure normal to wind during this storm reached $3/2 \times 29.25 = 43.88$ lb. per sq.ft.

Therefore, it would seem that 45 lb. per sq.ft. on normal surfaces is a not too safe value to use in design of buildings exposed to full storm intensity in such localities as Newberry (latitude 46 deg. 20 min.). This pressure existed below the tops of 2½-story buildings.

During the last year I designed a 60×120-ft. mill building having parabolic curved double triangular bowstring trusses and a 12-ft. wall height in which I used 45 lb. per sq.in. compression or 45 lb. per sq.in. suction for panels, with local higher stresses taken care of by extra nailing. The test described here would seem to justify such a value.

Newberry, Mich.

R. R. RYAN.

Cost of Operating Private Automobiles

Sir—The letter of S. B. Folk published in your issue of August 20, 1931, in regard to the operating cost of private automobiles, appears to contain one error. The fourth item in the table of costs reads, "Oil cost, cents per gallon, 25.6." Apparently this should be cents per quart.

The writer has owned and operated three automobiles during the past seven years. Each of these cars was a used car when purchased. Costs are shown in the table below. On the basis of this experience the operating cost of 1.83c. per mile reported by Mr. Folk for a four-cylinder Whippet appears unusually low.

	Essex 4-cyl Coach	Essex 6-cyl Coach	Franklin Convert Coupé
Total miles run to date	40,253	26,892	36,986
Miles run by first owner	6,046	4,219	21,977
Miles run by present owner (based for following costs)	34,207	22,673	15,009
Miles per gallon of gas	16.85	17.55	11.80
Miles per quart of oil	139	113	134
Gas cost, cents per gallon	19.95	20.20	16.75
Oil cost, cents per quart	26.60	25.00	31.80
Gas, cents per mile	1.185	1.148	1.420
Oil, cents per mile	0.194	0.222	0.238
Maintenance, cents per mile (including grease)	2.090	1.320	1.161
Tires, cents per mile	0.907	0.297	0.413
Total, cents per mile	4.376	2.987	3.232

In regard to the writer's four-cylinder Essex it should be said that an attempt was made to keep this car in 100 per cent condition at all times, which accounts for the high maintenance cost. The other two cars have received only such maintenance as was necessary to keep them in good operating condition.

JOHN N. BROOKS,
Assistant Division Engineer,
New Jersey State Water Policy Commission.

Trenton, N. J.,
Aug. 24, 1931.

NEWS OF THE WEEK

Illinois Prevailing Wage Controversy Settled

Decision of the prevailing wage rate appeal board in Illinois rendered Sept. 3 permitted bids to be opened Sept. 8 on highway work totaling more than $10,000,000. About one-third of the work is in the Chicago region, where the union scale of 97½c. for common labor was confirmed by the appeal board. Elsewhere in the state the scale set is a compromise and approximately 15 to 20 per cent higher than that originally advertised. Higher rates prevail in the neighborhood of the larger cities. In general 40c. and 45c. is the scale.

A taxpayer's suit requesting an injunction against awarding of highway contracts until the constitutionality of the prevailing wage act can be determined has been set for hearing Sept. 16. The state highway department has agreed to withhold awards without a temporary injunction pending the supreme court decision on the suit. More bids will be opened Sept. 15.

Pensacola, Fla., Adopts City Manager Plan

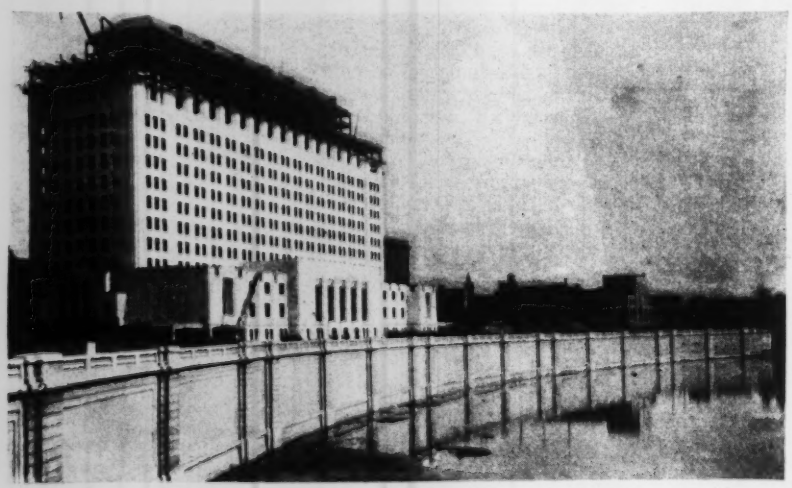
Supporters of the city manager plan of government won the election in Pensacola, Fla., on Aug. 31, by a vote of 3,389 to 374. The city has had commission government for 21 years.

Federal Highway Aid Jeopardized in Massachusetts

TWENTY BIDS were received by the Massachusetts department of public works for a highway project including a road and bridges at Gill and Greenfield, Mass. The lowest bid, of $350,997.85, was submitted by the A. L. Savin Co., a Connecticut contractor. The next higher bid, of $356,256 was from the Kelleher Corporation, of Massachusetts. In accordance with the policy recently adopted by the state government to give preference to home concerns, Frank E. Lyman, commissioner of the department, recommended that the contract be awarded to the Massachusetts firm. The recommendation was adopted by the governor's executive council which approved the award.

Letting this contract to the Massachusetts contractor at a higher figure than that submitted by a responsible out-of-state firm has caused the withdrawal of $162,000 in federal aid assigned for this project. This is intimated in a letter from Thomas H. MacDonald, chief, U. S. Bureau of Public Roads, to G. H. Miller, federal district engineer at Troy, N. Y. Part of this communication, forwarded to

(Continued on page 427)



STATE OFFICE BUILDING AT COLUMBUS, OHIO

This is the most recent addition to the group of government buildings in Columbus, Ohio, that is increasing the beauty of Scioto River shores. The building is of structural-steel and reinforced-concrete construction, with Georgia marble facing backed by hollow clay tile. The main part of the building is 317 ft. 6 in. by 73 ft. by 201 ft. 3 in. high, and has fourteen floors. A three-story-extension faces the river. Harry Hake, of Cincinnati, designed the building, which is being erected by the Struck Construction Co., of Louisville, Ky., as general contractor. The employment of a safety engineer by the contractor has been effective in reducing the number and severity of accidents.

Cobble Mountain Dam Contractor Sues City of Springfield

The city of Springfield, Mass., has been sued by Winston & Co., Inc., Kingston, N. Y., original contractor on the Cobble Mountain dam being built by the city water department near Westfield. Conversion of property is charged in one suit, for $1,000,000, alleging conversion of camp buildings, equipment, machinery, hydraulic apparatus and commissary supplies, all located at the site of the dam. In the second suit the plaintiff demands $327,770 for highway construction; and the third court action asks for $440,000 for back work and $166,000 for materials. Winston & Co. were awarded the contract for construction of the dam on Aug. 8, 1928. Work was started at once and continued until May, 1930. The contract was then abandoned upon complaint of the city's engineers that specifications were not being carried out. A new contract was awarded to S. J. Groves & Sons, Minneapolis, on July 11, 1930, for the completion of the work. Winston had placed 194,000 cu.yd. of rock fill and 159,000 cu.yd. of hydraulic fill at the time of ending his contract.

The dam will be completed some time this fall.

Investigation of Los Angeles Water and Power Opens

An investigation of the Los Angeles, Calif., water and power department, ordered by the city council, opened Sept. 1. James M. Hyde, chairman of the council committee conducting the investigation, announced that the committee was merely conducting a hearing and that no charges had been filed against anyone. The announced purpose of the investigation is to look into the affairs, administration and operation of the department. At the close of the first session, at which John R. Haynes, member of the board of water and power commissioners, was the principal witness, the hearing was adjourned to Sept. 15.

Seek to Stop Public Employees From Practicing Engineering

In a movement to stop public employees from practicing engineering and surveying on the side, Rochester, N. Y., engineers and surveyors have organized a body to be known as the Practicing Engineers and Surveyors of Rochester. Charles C. Hopkins is chairman of the executive committee, of which Lewis E. Kohl is secretary.

Federal Highway Aid Jeopardized

(Continued from page 426)

Arthur W. Dean, chief highway engineer, Massachusetts department of public works, reads as follows:

The bureau is opposed to any policy with respect to a federal-aid project which involves a rejection of the bids of a responsible out-of-state contractor and the making of an award to a home contractor who submits a higher bid. Such practice is wholly subversive to the principle of free and open competition in the award of contracts for public works. If, therefore, the contract for Massachusetts project No. 225-B (the Gill-Greenfield section) has been awarded to a Massachusetts concern, which was not low bidder, and the low bid of an out-of-state contractor rejected merely because he was from another state, we will not participate in the project.

State Commissioner of Public Works Lyman is taking the matter up with officials at Washington in the hope that the stand taken by the federal-aid bureau may be modified or that this decision will not affect the total of about $3,000,000 in federal funds estimated to be assigned for Massachusetts projects.

An attempt was made by William S. Youngman, lieutenant-governor of Massachusetts, in a stormy meeting of the executive council on Sept. 2, to have the council pass a resolution to refrain from discriminating against out-of-state contractors. This move was not successful, as the councilors withdrew from the chamber when Mr. Youngman began reading this resolution after they had objected its introduction by the secretary. Later the councilors decided to postpone consideration of all contracts for public works involving federal aid until Sept. 9.

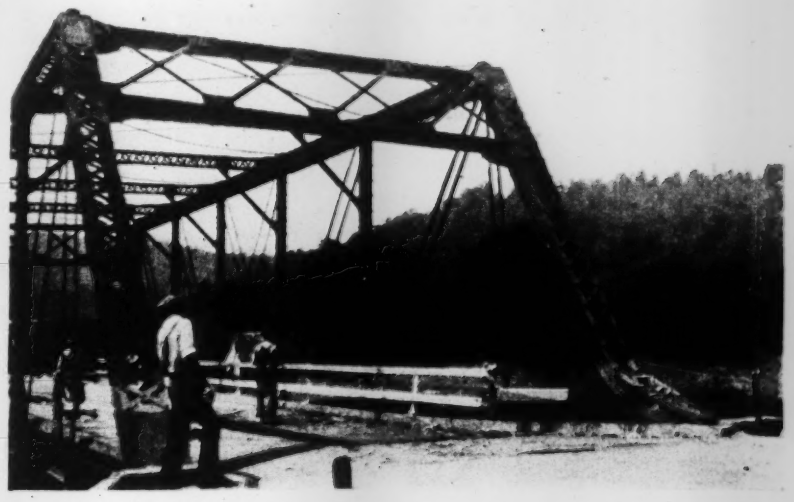
Baltimore Appoints Board to Make Garbage-Disposal Survey

Abel Wolman, chief engineer, state department of health, and Bernard L. Crozier, chief engineer, Baltimore, have been appointed by the Baltimore board of estimates to make a comprehensive survey of methods employed by other cities in handling and disposing of garbage and also of rubbish.

Contracts for garbage disposal and rubbish collection and disposal will expire on Dec. 31, by which time the board of estimates expects to have a definite program for the future.

Easterday Returns to St. Louis Water Department

Elton E. Easterday, formerly division engineer in charge of water supply and purification in the St. Louis, Mo., water department, whose resignation was requested by Water Commissioner Rilliet on Aug. 7 last (*ENR.*, Aug. 20, p. 311), has returned to the department as chief civil engineer under John B. Dean, who was advanced to the post formerly held by Easterday.



This bridge at Arlington, Mo., was badly damaged when struck by a 3-ton truck

Thirty-second Accident in Four Months Damages Bridge

The collision of a 3-ton truck and trailer loaded with apple-washing machinery with the end post of a bridge on U. S. Highway 66, at Arlington, Mo., resulted in the death of two men and the serious injury of a third recently. This is said to be the thirty-second serious accident at this spot during the four months since the pavement over the bridge was opened to traffic.

The bridge, a 130-ft. pin-connected span of seven panels, carries the highway pavement across the main tracks of the St.L.&S.F. Railway, and is located near the foot of a long winding down-grade stretch of pavement approaching the bridge from the north. The north approach to the bridge consists of a curve of fairly long radius compounded with a sharp curve of 200 ft. radius that leads directly to the north bridge portal.

The truck evidently gained considerable speed coming down the hill, and the driver was unable in the darkness to negotiate the short sharp approach curve. A further factor was the lack of superelevation on the approach curve. The motor unit struck the northwest end post with severe impact, but remained on the bridge slab, sliding along the west side. The trailer crashed against the post, and was reduced to splinters.

The northwest end post of the bridge, struck by the truck, was badly buckled, as can be seen by the illustration. The ends of the floorbeams on this side of the bridge dropped vertically about 10 in. and the connection angle between the west floor stringer and the floor beam failed by rupture. The northeast end post was sharply bent at the end of the portal strut and there was a sag in one set of top lateral sway rods. According to Clair V. Mann, assistant professor of engineering drawing of the Missouri School of Mines, it is surprising that complete collapse of the bridge did not occur.

The state highway department has been asked to place more suitable warning signs on the highway.

Hoover Dam Notes

Some work was done during the week ended Aug. 29 on all faces of the tunnels and adits at Hoover Dam. Here is the record as of that date:

Nevada adit, 178 ft. past intersection of tunnel No. 2; Arizona adit, completed to the intersection with tunnel No. 4; tunnel No. 2, 249 ft. upstream and 329 ft. downstream from the intersection with the Nevada adit and 680 ft. back from the outlet portal; tunnel No. 3, 363 ft. upstream and 521 ft. downstream from its intersection with the Arizona adit and 800 ft. upstream from the outlet portal.

Rapid progress is being made at the Denver office on the final designs for the concrete bulkheads at the inlets of the outer diversion tunnels. Studies are also progressing on alternative schemes of outlet works and on methods of grouting the foundation for the dam and the rock around the various tunnels.

Seven-day breaks were made on the second series of wet pretempered cement. In this test the normal mix was slightly the strongest, with the other mixes increasing in strength from 2½-hour premixed to the four-hour pretempered mixed. This latter mix, while below the normal mix in strength, was also wetter (by accident). This test was extended to 5½ hours' pretempering of the cement. The peak seemed to be as before at the four-hour mix for the seven-day test.

The first pump on the Boulder City water system was started Aug. 27. On Aug. 30 raw water was pumped as far as plant No. 2. It is expected that water soon will be delivered to the 100,000-gal. storage tank. The chemical treatment plant is being constructed.

Canada to Build Roads to Increase Employment

The governments of the Dominion of Canada and the various provinces are devoting much attention to measures for the relief of unemployment, the situation being considerably more serious than last year. The number of unemployed registered in Ontario is about 120,000, and the total for the dominion is estimated at 350,000. Seven of the provinces have applied for aid from the dominion government, and negotiations are in progress to fix the conditions under which it will be granted. A tentative arrangement provides that the dominion is to pay a maximum of 50 per cent of the cost of roadbuilding, and further consideration will be given as regards the construction of public buildings and other works in municipalities. While the provincial governments will decide upon the rate of wages to be paid, the dominion requires that a maximum eight-hour day be observed, in order to distribute employment as widely as possible.

Reclamation of Columbia River Basin Under Consideration

Reclamation of the Columbia River basin in the State of Washington will be considered Sept. 21, when engineers of the U. S. Bureau of Reclamation will confer with Roy R. Gill, representative of the Columbia Basin Irrigation League.

A report on irrigation, navigation, flood control and power possibilities in the basin has just been finished by the Army Corps of Engineers. The report is in eight volumes and will not be made public until it has been submitted to Congress.

Tri-State Pollution Control Planned in Large Area

Several plans for controlling the dumping of refuse into coastal streams have been submitted to the tri-state commission appointed to formulate a treaty to be entered into by New York, New Jersey, Connecticut and the federal government.

The members of the commission have agreed that the territory to be controlled should include the tributary watersheds and discharge points of pollution contributing to the metropolitan tidal area. In Connecticut this would include all of Fairfield County and the drainage area tributary to Long Island Sound east of Fairfield County to and including New Haven; in New York all of Long Island, Manhattan, Staten Island, Westchester County and all other drainage areas tributary to the Hudson River north of Westchester County, including Peekskill; in New Jersey all watersheds and streams tributary to the Hudson River, also the kills between New Jersey and Staten Island, Raritan Bay, and the seacoast from Sandy Hook to Ocean City and all those waters over which the tidal action is exerted.

Connors Creek Pumping Station, Detroit, Receives Tryout

During a heavy rainstorm on June 29 the pumping units in the new Connors Creek pumping station in Detroit, as well as the smaller unit in the intake well, were in operation. The four large 84-in. pumps are capable of pumping 225,000 gal. of water per minute each, and with the smaller unit, the combined capacity is more than 1,000,000 gal. per minute.

During the peak period of the storm, about 50 minutes, between 4:15 a.m. and 5:05 a.m., about 55,000,000 gal. of water was pumped, which required 14,000 hp. During the entire storm about 97,000,000 gal. was pumped.

Although water was standing over the curbs and the sidewalks on some parts of Jefferson Ave. just after the downpour occurred, no reports of flooded basements were received by the sewer department.

Joseph S. Stringham, city engineer, said: "The results accomplished in the rain of last night, preventing flooding in the district, indicated that the expenditure of funds for the installation was justified."

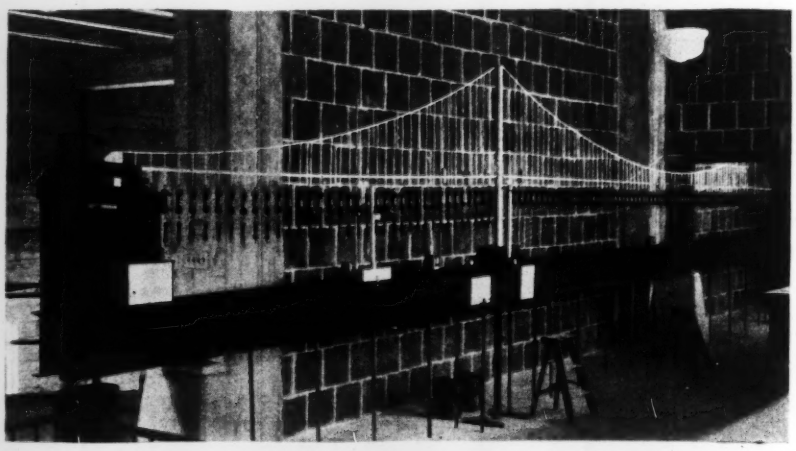
The pumping station and equipment, which cost about $1,500,000, was described in *Engineering News-Record* July 30, 1931, page 182.

Model Testing Well Advanced for San Francisco Bay Bridge

Tests on suspension span models for the proposed San Francisco-Oakland bridge being made for the California Toll Bridge Authority in the new engineering materials laboratory, University of California, are well under way. The investigations include the construction and testing of several accurate structural models on a 1 to 100 scale representing the 9,000-ft. main crossing between San Francisco and Yerba Buena (Goat) Island, which presents the major problems of span and clearance. The present studies have introduced several new refinements in the testing of suspension bridges, including the application of wind loads and measurement of resulting stresses.

Structural elements of the models are made of cold-drawn wire and rolled steel giving practically identical physical properties with material that would be used in the bridge. The supporting structure of steel channels eliminates the necessity of correcting for room temperature variations in the model and provision to introduce temperature stresses and deflections equivalent to actual field conditions is made by moving the towers and cable anchorages. For various conditions of loading and temperature, stresses in cable and stiffening truss, deflection of towers and stiffening truss and changes in grade of roadway are determined. By means of an elaborate system of nomographs the observations on the model can be translated into terms of the actual structure by simple inspection.

The model investigation is under the general supervision of Prof. R. E. Davis, director of the laboratory. Actual design and testing of the models is under immediate direction of Prof. G. E. Beggs, Princeton University. The work follows and extends the pioneer work he did last year on the model of the Mount Hope Bridge. This was the first structural model of a suspension span built for accurate stress analysis, and the results obtained by that investigation prompted the Toll Bridge Authority to use the present model study as a part of the design procedure for the proposed San Francisco Bay bridge. C. H. Purcell, chief engineer for the Authority, is in charge of the entire project.



One of the models for the San Francisco-Oakland bridge

Model on 1 : 100 scale represents a 4,460-ft. length of structure. Area of members and loads are proportioned to produce unit stress and strains equal to those in the actual structure; total deflections are 1/100 as large. Temperature stresses and deflections are induced by movement of the towers and anchorages. Tower as shown is free to swing about horizontal axis; to produce effect of tower stiffness on model, weights are placed on lower end of tower.

Plan for Joint Sewage-Disposal Plant for Twin Cities

Officials of St. Paul and Minneapolis have reached an agreement on most of the major points involved in a plan to construct a two-city joint sewage-disposal plant, and attorneys are drafting a bill to be presented to the legislature authorizing the project. The bill, according to the present agreements, will provide for:

Establishment of a metropolitan drainage district embracing the areas of Minneapolis and St. Paul.

Creation of a commission of seven members to supervise construction of disposal works, including the mayor of each city and two members to be selected by each city council, with the seventh member to be chosen by the six.

Allocation of the cost of the works to be used jointly on a basis of assessed valuation for ten years from the start of construction, and thereafter on a volume basis.

Construction and maintenance by each city of works it will use exclusively.

Minneapolis has charter authority to levy a tax up to 2½ mills to finance its share of the project, but St. Paul would have to issue bonds, authorization for which would require a vote of the people of the city or a legislative act.

Work Starts on Water-Pumping Station at Memphis

Steam shovels started excavation work on Aug. 31 at Normal, Tenn., for the $2,000,000 James Sheahan water-pumping station for the city of Memphis. The entire working force on the substructure contract will be Memphis men, except five men brought from the Detroit office of Jerome A. Utley Construction Co., the contractor.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Favorable Action Expected On Bill Allotting Funds For Topographical Mapping

FAVORABLE consideration by the Bureau of the Budget and Congress of the new method proposed by Representative Temple, of Pennsylvania, for allotment of funds for topographical mapping is expected in its indorsement by American Engineering Council, its constituent societies and the Association of State Geologists. The amendment drafted for inclusion in the next interior department appropriation bill will be considered by the Budget Bureau at a hearing Sept. 23.

The new method does not involve an increase in the annual appropriation for mapping, which has averaged about $780,000, but provides that $10,000 be expended annually in each state regardless of its ability to cooperate financially. This plan has the advantage of permitting the mapping program to be carried on more efficiently and economically without preventing further work in states that are willing and able to match dollar for dollar the remaining $300,000 of the federal appropriation. With an even distribution of funds field work can be conducted more economically by taking advantage of seasonal conditions.

Under the plan now being followed $237,000 of the total is allotted for mapping federal reserves under the jurisdiction of the Forest Service, Indian Bureau, National Park Service, and other federal agencies and the balance of $543,000 set aside for mapping in the states can be used for that purpose only in states that contribute a similar amount.

Defects of Present System

The shortcomings of the present method of restricting the extent of mapping work to the 50-50 basis of expenditure is well illustrated in the situation that confronts the topographic branch of the U. S. Geological Survey this year. State appropriations that were expected to amount to $543,000 have been curtailed to $370,000 as a result of the shrinkage in state revenue, with the result that the topographic branch has been able to use only a corresponding amount of the $543,000 fund credited to its account in the federal treasury.

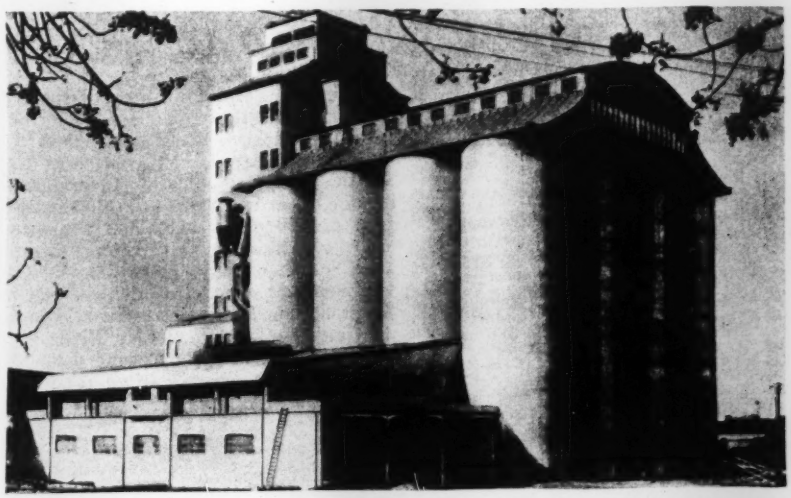
Because of this limitation on the use of its appropriation the topographic branch has been forced to furlough about 50 of its junior engineers and aides who ordinarily would be busy in the field at this season of the year and throughout the winter. Without an allotment of $250,000 from the Mississippi River Commission to carry on mapping in Missouri, Mississippi and Louisiana, the progress of the work of the topographic branch would be even more greatly curtailed, as it is not likely that the Flood Control Commission will transfer more funds for this purpose after this year.

Navy to Use Radium to Detect Defects in Steel

Utilization of the gamma ray of radium to detect hidden defects in steel and other metals has been decided upon as part of the regular procedure of the bureau of construction and repair of the navy. A lump of radium weighing 485 milligrams has been procured and is being prepared for use at the Naval Research Laboratory near Washington. The price of this radium was nearly $30,000. It is understood that one of the deciding factors that led to the purchase of the radium was the recent discovery of serious defects in the stern posts of several of the new cruisers. Superficial tests were sufficient to reveal these defects but it is thought that the radium may prove to be useful in the future if the usual methods fail to disclose any flaws. Naval officers point out that large savings can be effected if high-pressure castings are examined by the radium method before additional money is spent for machining work. It is also expected that the radium will be valuable in showing up poor design and pattern work.

Railroad Rate Case Closes Sept. 21

The railroad freight rate advance case will close with final argument before the Interstate Commerce Commission in Washington on Sept. 21. Railroads and shippers have been instructed by the commission to file briefs summarizing the evidence for and against the 15 per cent increase sought by the railroads not later than Sept. 18.



LARGE REINFORCED-CONCRETE ELEVATOR IN ARGENTINA

One unit of the 80,000-ton reinforced-concrete grain elevator at Rosario de Santa Fe, Argentina. This unit, which was put into service July 19, has a capacity of 20,000 tons. The rest of the bins are to be finished by the end of next year. This is the first terminal elevator of a contemplated system of more than 600 local and at least five terminal elevators in the grain-producing district of the republic, bids for some of which will be asked in the near future.

Progress of Federal Public Buildings Program

That part of the federal plan to relieve unemployment comprised in the public buildings program under the treasury department shows that 750 projects has been authorized and 164 firms of architects are engaged in plans and supervision. Progress of the projects is officially summarized as follows:

Buildings to the number of 115 have been completed at a total cost of $39,869,569. Three buildings have been completed during the past month.

There were 229 buildings in construction at the first of September by contract, at an estimated cost of $181,393,100, there having been 37 contracts let during the last month, of a total value in excess of $25,000,000.

There are 65 projects in which the sites have been arranged, drawings are completed, for which construction contracts have been invited, of a total estimated cost of $19,319,600.

There are 202 projects in which sites have been selected and on which plans are now under way, of a total estimated cost of $178,766,523.

At the first of this month there were 199 projects in which the sites have been determined upon and are in process of being acquired, the estimated cost of the buildings thereon being $49,545,400.

It is estimated that the number of men now directly and indirectly employed on this program is 39,000. It is expected that the number that will be directly and indirectly employed on Jan. 1 will total 100,000.

COSTS AND CONTRACTS

ENR Index Numbers

Cost		Volume	
Sept. 1, 1931	**171.40**	**August, 1931**	**187**
Aug. 1, 1931	171.38	July, 1931	248
Sept. 1 1930	199.58	August, 1930	259
Average, 1930	202.85	Average, 1930	260
Average, 1929	207.02	Average, 1929	317
1913	100.00	1913	100

This Week's Contracts

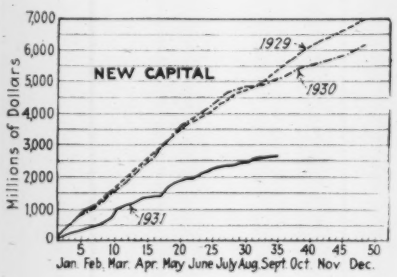
Heavy construction contracts, reported by *Engineering News-Record* in the week of Sept. 10, with some comparisons, total as follows:

(In Thousands of Dollars)

	Sept. 10, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,277	$2,349	$4,867
Other	6,133	12,450	19,745
Streets and roads	3,951	7,232	10,198
Other construction	16,398	21,138	11,903
Total	$27,759	$43,169	$46,714

Total, all classes, Jan. 1 to Sept. 10:

1931	$1,884,204
1930	2,458,757



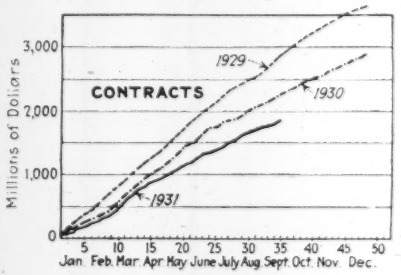
Indiana to Take Over 300 Miles of County and Township Roads

As a means of reducing unemployment the state highway commission of Indiana has announced that it will take over about 300 miles of county and township roads for maintenance. The roads already are in the "dotted line" system, which comprises roads which the commission intended to take over eventually. It was estimated that approximately 120,000 working days will be provided in taking over the new roads. The department has a surplus of about $750,000 because the roads were not damaged last winter by floods or freezes.

Capital and Contracts

Issues of new capital totaled only 6 millions in the week ended Sept. 5, compared with a weekly rate of 25 millions in August and 84 millions in September, 1930. None of the new financing of the last week was for privately owned construction work. Of the public issues, the principal bond offerings were State of New Hampshire 3½s, $1,000,000, highway, and Norwalk, Conn., 4s, $220,000, sewage disposal.

Cumulatively, capital issued between Jan. 1 and Sept. 5 totaled 2,600 millions, compared with 4,948 millions in the corresponding period of 1930.



SOCIETY CALENDAR

AMERICAN ASSOCIATION OF ENGINEERS, Chicago; annual convention, Huntington, W. Va., Sept. 28-30.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington, annual meeting, Sept. 28-Oct. 1, Salt Lake City.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York; annual convention, Montreal, Sept. 14-17.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; fall meeting, St. Paul, Minn., Oct. 7-9.

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS, St. Louis; meeting, Oct. 19-26, Pittsburgh.

AMERICAN WELDING SOCIETY, New York City; fall meeting, Sept. 21-25, Boston.

INTERNATIONAL CITY MANAGERS ASSOCIATION, Chicago; annual meeting, Oct. 7-10, Louisville, Ky.

INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Chicago; conference, Sept. 24-26, New York City.

NATIONAL MUNICIPAL LEAGUE, New York City; annual meeting, Nov. 9-11, Buffalo, N. Y.

NATIONAL SAFETY COUNCIL, New York City; twentieth annual safety congress, Chicago, Oct. 12-16.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston; annual convention, Sept. 29-Oct. 2, Boston.

AMERICAN ASSOCIATION OF ENGINEERS, meeting in annual convention in Huntington, W. Va., Sept. 28-30, will hear addresses by Arthur Richards, Mamaroneck, N. Y., on "Services and Fees of Engineers"; by C. J. Ulrich, Salt Lake City, on "Enforcement of Registration"; by B. V. Siems, New York City, on "Public Improvement and the Tax Rate"; and by J. A. L. Waddell, New York, on "Engineering Education." At this convention the Clausen medal, for the most outstanding engineering achievement in the United States during the last year, will be awarded. Announcement of the winner will not be made until the opening session of the convention.

ATLANTIC DEEPER WATERWAYS ASSOCIATION will hold its annual convention in Boston Oct. 5-9. About 800 delegates are expected from the cities along the entire Atlantic seaboard. National authorities on waterways will speak.

CONCRETE REINFORCING STEEL INSTITUTE has completed arrangements for a semi-annual meeting to be held at Shawnee-on-Delaware, Pa., Sept. 28-30. For this meeting a number of the committee reports have been dispensed with and the larger part of the sessions will be devoted to matters of immediate concern to the industry.

WASHINGTON STATE ASSOCIATION OF COUNTY COMMISSIONERS and the COUNTY ENGINEERS' ASSOCIATION OF WASHINGTON will hold a joint convention in Spokane Sept. 24-26. Law administration, budget law questions and highway maintenance are among the subjects on the business program. Particular attention will be given to plans for alleviation of unemployment.

WASHINGTON STATE GOOD ROADS ASSOCIATION will hold its 32d annual convention at Centralia Sept. 11-12. One item of business will be the report of the special committee, appointed in 1929, which has been studying highway administration.

Obituary

RALPH H. OBER, member of the engineering firm of Jacobs & Ober, of Seattle, Wash., died on Aug. 30 at the age of 60 years. Mr. Ober was one of the designers of the Aurora Ave. bridge, nearing completion in Seattle, and for 40 years had been connected with city and public works projects, both in the employ of the federal government and in private practice. Prominent among the projects in which he had engaged are the Cedar River pipe lines, the Cedar Lake storage dam, the Skagit River investigations and the Columbia Basin irrigation surveys. From 1908 to 1911 he was assistant city engineer of Seattle, and following that a member of the board of public works and superintendent of buildings for the city. Born in Beverly, Mass., in 1871, he went to Seattle as a federal employee in 1892, and had resided there since that time. He was a member of the American Society of Civil Engineers and a past-president of the Engineers Club of Seattle.

Construction Equipment and Materials

New Pipe-Calking Material

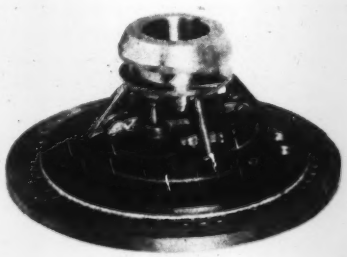
After having specialized for years in the production of virgin quality pig lead for calking water mains, Michael Hayman & Co., Inc., 856 East Ferry Street, Buffalo, N. Y., has brought out a self-calking material as a substitute for lead for this purpose, which is being marketed under the name of Haymanite cement. This material is simply melted and poured into the joint, no calking being required. It is shipped in powder form, packed in bags containing 100 lb. each.

Clutch Resists Drag Caused by Centrifugal Force

In certain heavy-duty clutch installations it is necessary to take into consideration the effect of centrifugal force on the clamping member, or floating plate, of the clutch. This condition will occur, for instance, when the clutch proper is the driving member and therefore rotates continuously during the time the mechanism is in use, whether the driven member is being operated or not. With such an installation the usual operating mechanism will tend to extend radially outward, like the flyballs of a governor, and this will tend to close the clutch, thereby causing drag of the plates and consequent wear.

To overcome this tendency the Twin Disc Clutch Co., Racine, Wis., has designed the new Twin Disc Type C. R. clutch. Centrifugal force will cause the inner ends of the levers to fly outward and this in turn will apply tension to the toggle links, which are connected to the clamping plate. It follows therefore that the greater the action of centrifugal force the greater will be the pull tending to draw the clamping plate away from the friction disk, or driving plate.

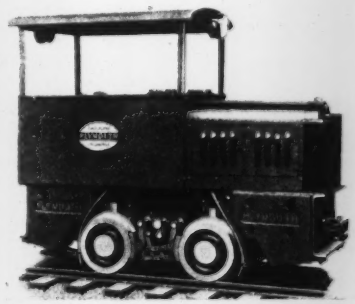
It will be further noted that when the clutch is being operated to engage it, the initial movement of the clamping plate will be comparatively fast, but as it reaches its closed position it slows down due to the straightening of the toggle links, which now exert their maximum pressure. Provision is made to carry the links over center, and the inner ends of the levers are also moved beyond the true radial line, in order to insure a locked engaged position. When releasing the clutch, the first movement is very powerful, insuring the breaking loose of the plates, and this is followed by a more rapid motion to the position of full release. Adjustment is performed in the usual manner, and the levers are operated by a simple form of sliding sleeve.



Heavy-duty clutch

Gasoline Locomotive Uses Truck Motor and Transmission

To meet the requirements of contractors having a light haulage problem, a new model gasoline locomotive equipped with Ford engine and four-speed truck transmission has been announced by the Fate-Root-Heath Co. (Plymouth Locomotive Works), Plymouth, Ohio. Built in four weights—2½, 3, 3½ and 4 tons—on a short wheelbase to negotiate sharp curves and with abundant power, these units are particularly useful for contractors, quarries, sand, gravel and clay plants and for general industrial haulage. A Plymouth reversing transmission, connected by a shaft and universal joints to the Ford four-speed truck transmission, provides four speeds in either direction. Side frames, bumpers and cross-supports are of heavy structural and bar steel, well braced and rigidly riveted and welded together. The large, roomy cab gives clear vision in all directions. Standard equipment provides electric starter, generator, headlights, horn and oil-moistened air cleaner.

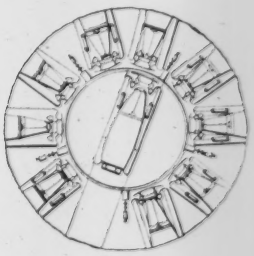


Gasoline locomotive

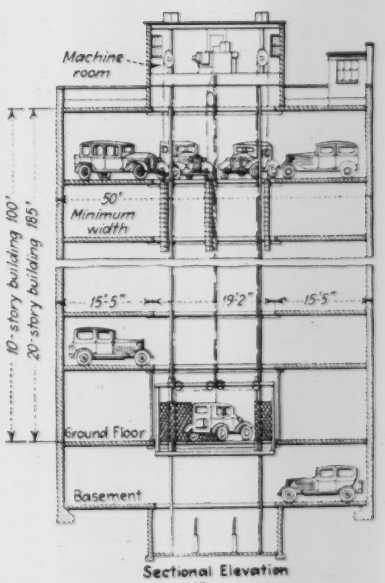
Inbuilt Circular Garage for Automobile Storage

Space in apartment houses, office buildings and other structures usually devoted to interior rooms of inferior value can be utilized for parking automobiles by the use of a circular elevator garage developed by William P. Allred, Jr., architect, and F. E. Turner, president of the Turner Elevator Co., 2601 Madison Ave., Kansas City, Mo. The system consists of a high-speed circular elevator equipped with a rotating platform, having mounted thereon a loading, locking and unloading device driven and controlled by electricity. On each floor the elevator shaft serves a circular space with room enough for parking ten automobiles arranged radially. All equipment for handling the cars is placed on the elevator and is standard in form; the interior steel structure of the building is also standard, and can be made in any quantity from one set of templets. A single unit of this type requires ground area about 50 ft. square; multiple units can be used when desired. Fireproof construction is obtained by inclosing the elevator hatchway for the full height of the building; the inclosing walls of the garage are also solid, making a building within a building.

Operation of the device is very simple. The automobile is driven to the entrance of the elevator on the ground floor and left with the brakes off. An electrically driven two-speed loading device pulls it on the elevator, locks it in position during the period of vertical travel, and places the car in its designated place. During the period of ascent the elevator platform is rotated



Plan



Sectional Elevation

Circular elevator garage

into the proper position. To return the car to the street floor these operations are reversed, using the same equipment.

Rigging a Drag Scraper to Turn a Corner

Ordinarily the path of a power drag scraper is a straight line from the digging or loading point to the dumping point. There are, however, situations that require the scraper to turn a corner somewhere along its span and work along two paths at nearly right angles to each other. With a patented dog-leg device recently developed by Sauerman Bros., Inc., 432 South Clinton St., Chicago, Ill., an operation of this sort is entirely feasible.

Where the customary drag scraper installation consists of a two-drum hoist, two operating cables for inhauling and outhauling and two guide-block supports (one at each end of the span), the dog-leg installation consists of a three-drum hoist, three operating cables and three guide-block supports. The third block support is at the point where the scraper makes its right-angle turn, and the third operating cable is a center-haul cable which serves to pull the bucket toward the turning point on both the inhaul and the backhaul. This center-haul cable passes over a guide-block at the turning point to a rod connecting the front and rear bridles of the scraper, so that it pulls on the front bridle during the inhaul but slides to the back of the bucket to pull on the rear bridle during the backhaul. The regular loadline pulls the loaded scraper from the turning point to the dumping point, and the regular pullback cable returns the empty bucket from the turning point to the digging point.

Some of the situations that make an installation of this sort desirable are: (1) digging or reclaiming from storage parallel to tracks and turning a corner to mount a carloading incline; (2) excavating in a basement or reclaiming from a storage room where columns make it impossible to work radially from the hopper or dump; (3) in underground mines, loading cars in a corridor at right angles to the working face; (4) digging lengthwise in trenches and turning to drag the spoil onto the bank. It is also possible to use this device with two tractors, one with a double-drum and the other with a single-drum hoist, instead of the regular three-drum scraper hoist; or to equip the second tractor also with a two-drum hoist and use the extra drum for operating a rapid-shifting device. In the accompanying illustration, a 1½-yd. scraper reclaims mine waste from a pile under a track hopper, turns a right angle and drags the spoil out to a dump parallel with the tracks.

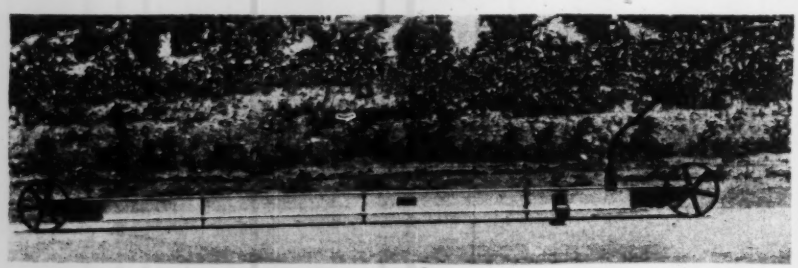
Drag scraper bucket turning corner

Manganese Steel Welding Rod

As the result of research work done at the Chicago Heights plant of the American Manganese Steel Co., a patent was recently issued to Frank A. Fahrenwald, research engineer, covering a manganese steel welding rod, that, according to the company, will leave a deposit equivalent in analysis and physical properties to heat-treated manganese steel; that can be used satisfactorily by any welder fairly competent with the electric arc; that will not require special heat-treating or quenching, but will give the characteristics of standard manganese steel under ordinary air cooling. The patent claims cover a very broad range of the principal elements, as follows:

Iron	25.00 to 90.00 per cent
Manganese	5.00 to 25.00 per cent
Carbon	.50 to 2.00 per cent
Nickel	.25 to 50.00 per cent

The patent has been assigned by Mr. Fahrenwald to the company, which now has a complete stock of the rod in the usual range of sizes. It is widely used in the repair of manganese steel castings and in the reclamation of such equipment as dipper teeth, crusher jaws, railway track members and similar objects. It can also be used on parts made of ordinary steel and as a wear-resistant coating on almost any kind of steel casting.



TESTING ILLINOIS HIGHWAYS FOR SMOOTHNESS

Surface deviations of ⅛ in. are accurately indicated by this new type of 10-ft. straight-edge highway tester made by Oscar Ansell & Son Co., Springfield, Ill., for the Illinois state highway department. Testing is accomplished by means of adjustable stud bolts with casehardened points attached to the lower side of a 4-in. aluminum I-beam. The substitution of light aluminum alloys for heavier materials cuts the weight of the machine to but 64 lb.

New Publications

Oil Pumps—Centrifugal oil refinery pumps are described in bulletin 314, a 38-p. illustrated publication of the BYRON JACKSON Co., Berkeley, Calif.

Stainless Steel—REPUBLIC STEEL CORP., Youngstown, Ohio, has issued a folder describing Enduro FC, a recent addition to the family of Enduro stainless steels.

Electric Heaters — Electrically heated melting and coating tanks suitable for asphalts, tars and other viscous materials are described in bulletin 230, issued by H. O. SWOBODA, INC., 3400 Forbes St., Pittsburgh, Pa.

Models—A number of interesting technical models of various types of structures and equipment ranging from bridges to electric locomotives are illustrated in an 8-p. bulletin issued by the PAUL F. HERMANN Co., Keenan Building, Pittsburgh, Pa.

Shoveling Machines — MYERS-WHALEY Co., P. O. Box 781, Knoxville, Tenn., has issued a 12-p. illustrated catalog giving details of its shoveling machines for rock and tunnel work.

Cement Handling—Fuller-Kinyon portable unloading and conveying systems for bulk cement and other pulverized materials, with particular emphasis on the new unloading pump, are discussed in a 12-p. catalog of the FULLER Co., Catasauqua, Pa.

Sheet Steel—INLAND STEEL Co., Chicago, Ill., has issued a new edition of the booklet, "Inland Open Hearth Sheet Steel Products" which contains all information necessary for ordering steel sheets, including standard extras and differentials, sheet weights, bundling tables, commercial tolerances and trade customs and practices. The booklet is pocket size and contains 56 pp.

Electrical Equipment — Recent publications of the GENERAL ELECTRIC Co., Schenectady, N. Y., include a catalog sheet describing automatic float switches for motor-driven pumping equipment, an 8-p. bulletin on new GE arc welders, and a new edition of the bulletin "Arc Welding in Industry."

Excavators — BUCYRUS-ERIE Co., South Milwaukee, Wis., has published a 24-p. illustrated bulletin on the recently announced 21-B shovel-dragline-clamshell-lifting crane.

Heavy Machinery—Catalog 31, issued by the EARL GEAR & MACHINE Co., Philadelphia, Pa., gives detailed specifications for metallic and non-metallic gears, racks, sprockets, sheaves, speed reducers and bridge-operating and similar machinery.

Grader—Bulletins 1237 and 1239, published by the AUSTIN-WESTERN ROAD MACHINERY Co., 400 North Michigan Avenue, Chicago, Ill., cover contractors' special elevated graders and the new model 77 dual-drive motor grader, respectively.

Contractors' Equipment—LA PLANT-CHOATE MFG. Co., INC., Cedar Rapids, Iowa, has issued a bulletin describing the Dukelow hardpan plow and the LaPlant "Roadlayer" track used on earth-hauling equipment.

CONSTRUCTION NEWS

CONTENTS

Engineering Structures:	Page
Airports	102
Bond Elections	101
Bridges	99a
Dams	102
Equipment	103
Excavation	101
Federal Government	101
Foreign	103
Grade Crossings	102
Heating and Ventilating	103
Materials	103
Parks and Sports	103
Piers and Wharves	102
Power and Lighting	103
Railways	102
Sewers	99
Streets and Roads	99a
Subways and Tunnels	102
Waste Disposal	99a
Waterworks	99
Unclassified	103
Industrial Buildings	
Factories and Mills	106
Garages	106
Power Plants	106
Shops and Foundries	106
Warehouses	106
Commercial Buildings	
Banks	105
Churches	104
Clubs	104
Hospitals	104
Offices	105
Public	105
Residential	103
Schools	104
Stores	105
Theatres	105
Unclassified	106

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Sewers			
Cleveland	Sewage disposal	$3,000,000	Bids asked
Bridges			
Hartford	Bridge	5,000,000	Proposed
Shelter Island (N. Y.)	Bridge superstructure	1,299,919	Contract
Streets and Roads			
Texas	Roads, Bridges	4,500,000	Bids asked
Federal Government			
New York	Post office	5,233,000	Contract
Cincinnati	Post office	2,800,000	Proposed
Power Plants			
Los Angeles	Power plant unit	1,000,000	Proposed
Buildings			
New York	Church	2,000,000	Proposed
St. Louis	Hospital	1,500,000	Proposed
New York	Hospital	1,100,000	Proposed
Lakewood (O.)	Hospital	1,000,000	Proposed
Pittsburg	Hospital	1,500,000	Proposed
Detroit	Office	2,000,000	Proposed
Los Angeles	Schools	1,000,000	Bids asked
South Bend (Ind.)	University	1,000,000	Proposed

WATERWORKS

PROPOSED WORK

Ill., Wilmette—Village Water Bd. considering own waterworks, hence distribution system and main extension to Evanston for supply, postponed indefinitely. $100,000.

Ind., Petersburg—Petersburg Water Filtration Co. new filtration plant along banks White River, $80,000. W. C. Drof, Petersburg, secy.

Ia., Indianola—For 300,000 gal. tank on tower, etc. Brown Eng. Co., 108 North Market St., Ottumwa, engr. awarded contract deep well, to Thorp Bros. Well Co., 2340 6th St., Des Moines, $1,700.

Mo., Everton—Waterworks, incl. deep well, tower, tank. $20,000. J. D. Alexander, Springfield, engr.

O., Cleveland—Preliminary plans brick, stone, rein.-con. high service reservoir, Wooster Rd. $600,000. L. A. Quayle, City Hall, engr.

Wis., Waupaca—Wisconsin Veterans Home, c/o W. A. Holden, water purifying plant at Wisconsin Veterans Home, incl. full equipment installed. W. C. Kirchoffer, 22 Carroll St., Madison, engr.

Ont., Lindsay—Town, deep wells with pumping equipment, capable supplying 2 m.g. (Imperial) per day. $20,000. O. W. Smith, Lindsay, engr.

Que., Sillery—Municipal Council, M. Gauthier, mayor, aqueduct. $55,000. Residents authorized Town Council to borrow $225,000 for use in construction waterworks. Noted July 16.

Mich., Detroit—Sept. 15, by Dpt. Water Supply, 735 Randolph St., backfilling around power and filtration structures at Springwells Station, incl. 80,000 cu.yd. backfilling, 30,000 cu.yd. to be taken from Borrow Pit, 50,000 cu.yd. foundry sand and material from spoil piles existing on site of work. $50,000. G. H. Fenkell, 735 Randolph St., genl. mgr.

BIDS ASKED

O., Canton—Bd. Control bids about Mar. 1, 15 m.g. new equalization basin in northeast section city, $145,000. W. E. Sarver, City Hall, engr.

Wash., Seattle—Mountain Lakes Water Co., Bothell, bids about Sept. 12, earth dam, incl. 15,000 cu.yd. earthwork, 16 in. steel-welded pipe river crossing, in water 10 ft. deep for 300 ft. $5,000. J. C. Trueheart, engr.

CONTRACTS AWARDED

Ill., Glencoe—For 500,000 gal. tank on tower, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, $28,500; 4,200 ft. 16 in. c.i. pipe, specials, to R. D. Wood & Co., 310 South Michigan Ave., Chicago, $8,665; vault, laying pipe, to Highway Constr. Co., $5,030; altitude valve to O. C. Keckley Co., 565 West Washington Blvd., Chicago, $925; valves, to Ludlow Valve Mfg. Co., 228 North La Salle St., Chicago, $275. Grand total $43,395.

Ia., Indianola—See "Proposed Work."

Mass., Boston—Dpt. P. Wks., laying, relaying water pipe in Morton St., Dorchester, to C. Struzziery, 115 Kitterage St., Roxbury. Est. $15,000. Noted July 29 Daily.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Dean St., to Bronx Water Works, 1 Riverdale Ave., New York. $7,900. Noted Aug. 20.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., steel and c.i. mains in Park Ave., to Beaver Eng. & Contg. Co., 51 Chambers St., $17,726. Noted Aug. 20.

N. Y., New York—J. J. Dietz, Comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Amundson Ave., to Kniden Constr. Co., 4197 Park Ave., $15,800. Noted Aug. 20.

O., Cleveland—Cuyahoga Co., c.i. water mains in Merkle Ave., West 54th St. and Ridgewood Dr., Water Main Impvt. 199, to J. A. Hickey, Inc., 308 Euclid Ave., $49,135. Former contract rescinded. Noted Aug. 20, under "Contracts Awarded."

Pa., Charleroi—Tri Cities Water Co., 403 Fallowfield Ave., relocating 1,500 ft. 20 in. c.i. main in Westmoreland and Washington Counties, to Rod & Moody, Charleroi.

Wash., Elma—City Council, 15,000 ft. 4- to 10-in. mains to H. G. Purcell Co., Colman Bldg., Seattle, $14,339. Noted July 9.

Ont., Ottawa—Bd. Control, c.i. pipe and specials, to J. T. Hepburn, 18 Van Horne St., Toronto, $11,527; automatic valves and chlorination, to W. J. Westanay & Co. Ltd., $12,396 and $9,992 respectively; pneumatic conveying equipment and chemical feed machines, to General Supply Co. of Canada Ltd., 360 Sparks St., Ottawa, $6,750 and $11,125 respectively. Grand total $51,790. Noted July 30.

Que., St. Stanislas—Deux Rivieres Municipality, 22,800 ft. 4 to 6 in. c.i. pipe, 14 cisterns and 1 concrete dam, to J. A. Auclair, Giffard, $36,975. Noted May 14.

SEWERS

PROPOSED WORK

Calif., Los Angeles—Los Angeles Co., Belvedere Gardens Unit 4, Sewerage System (Co. Impvt. 757), incl. 13,800 ft. 8 in. vitr. sewer, 3,500 ft. 8 in. vitr. sewer with concrete cradle, manholes. $65,000.

Calif., Westmoreland—Bd. Trustees Westmoreland Sanitary Dist., received no bids for bonds to finance construction lateral sewerage system. Will re-advertise.

Ill., Waterloo—City, E. C. Jobush, mayor, preliminary plans complete sewerage system, $85,000-$90,000.

Kan., Leoti — City Council, C. A. Haskins, engr., 822 Finance Bldg., Kansas City, Mo., submitted report sewerage system. $25,000. **Maturity probably this fall.**

Mich., Birmingham—Village Dpt. completing plans, 3,747 ft. 27- to 72-in. double rein.-con. concrete sewer, 14 manholes in Woodward Ave. from Lincoln Ave. to outlet south of Clawson Rd. I. E. Hanley, village clk.

O., Canton—Bd. Control, sanitary sewer to serve Middlebranch-Nimishillen Creek Dist. $100,000; storm water sewers to replace sewers now in use in Walnut and Cherry Ave. N.E., $40,000-$50,000. W. E. Sarver, City Hall, engr.

Tex., Dallas—City, c/o E. Goforth, soon takes bids storm sewers and inlet changes on Davis St. from Zangs Blvd. to Rosemont St.

Ont., London—Sewerage system extensions in North East London. $100,000. W. P. Near, city engr.

BIDS ASKED

Calif., Long Beach—Oct. 2, by City Council North Long Beach Sewer System (Pump Sewer Dist. 11), 250,000 ft. 8 in. and 17,590 ft. 12 in. vitr. clay sewers, 95,600 ft. 6 in. vitr. connection sewers, 600 g.p.m. pumping station, incl. two 6 in. and one 8 in. pumps.

N. Y., Brooklyn—Sept. 16, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, sewers in Avenue D, Kings Highway, East 53rd, East 54th, East 51st and East 52nd Sts.

N. Y., Long Island City—Sept. 14, by G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., sewer in 209th Pl., 58th, 88th, 84th, Desare Rds., Ditmars, 78th, 89th, 93rd, 100th, 107th, 110th Aves., 51st, 54th, 75th, 93rd, 207th, 247th, 248th, 237th, 240th, 197th, 201st, 134th, 161st, 173rd, Colfax, Inwood and 38th Sts.

N. Y., Walden—Sept. 15, by Village, R. E. Baird, clk., sanitary and storm sewers. G. C. Diehl, 573 Elliott Sq., Buffalo, consult. engr. adv. E. N.-R. Sept. 10.

O., Cleveland—Bids after Oct. 1, reinforced aeration and sludge settling tanks, East 140th St. and Lake Erie. $3,000,000. G. B. Gascoigne, Leader Bldg., engr. Noted July 2.

B. C., Vancouver—See "Contracts Awarded."

CONTRACTS AWARDED

Kan., Canton—City Council, 29,158 ft. 8- to 12-in. vitr. tile pipe, 60 ft. 8 in. c.i. pipe, 670 ft. 6 in. on 8 in. and 16 ft. 6 in. on 10 in. Y branches, 66 manholes, 12 flush tanks, 12 service connections, 108 ft. extra depth manhole, 1,900 ft. 4 in. c.i. pipe, sewage treatment plant, incl. Imhoff tank, dosing tank, rock filters, sludge bed, by-pass, to O'Neil Constr. Co., Leavenworth, $36,000. Noted Aug. 13.

Kan., Dodge City—E. C. Hathway, city clk., sewers and sewage disposal plant, Sect. 1, 15,800 ft. 8- to 27-in. main and outfall sewers, Sect. 2, 1,000 ft. 6 in. welded steel force main across Arkansas River, Sect. 3, complete sewage disposal plant, incl. 850 cu.yd. concrete, to C. L. Burt, Hutchinson, $110,068. Noted Aug. 14.

Mass., Boston—See "Streets and Roads."

Mass., Quincy—Metropolitan Dist. Comm., 20 Somerset St., Boston, pumping station, reservoir, 16 in. force main, Newland St., to A. D. Daddario 15 Agnes Ave. Hyde Park, $37,630.

Mich., Dearborn—City, furnishing equipment for new sewage disposal plant, to Filtration

See proposal advertising on page 81

Constr. News, page 99

LEADITE

Trade Mark Registered U.S. Pat. Office

Under well-paved streets . . . with heavy traffic LEADITE is widely used

—and this is due to the fact that LEADITE has proven "so dependable" in every respect.

Bell and Spigot Water Mains buried beneath well-paved streets with heavy traffic MUST HAVE TIGHT JOINTS,—otherwise the streets would have to be dug-up to repair leaky joints; traffic would have to be re-routed, and in addition, the Water Users would be greatly inconvenienced.

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Thousands of miles of Water Mains are jointed with LEADITE for Reliability,—and for Permanency.

The pioneer self-caulking material for c.i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

No Caulking

Sewers (Continued)

Equipment Corp., 350 Madison Ave., New York, $171,451.

N. J., Ventnor (br. Atlantic City) — Joint Meeting Ventnor and Margate Cities, City Hall, joint sewage treatment works, to Standard Eng. & Constr. Co., Ventnor, $291,480. Noted Aug. 27.

O., Shaker Heights (br. Cleveland)—Storm sewer in Southington Rd. and culvert in Attleboro Rd., to Curro & Whittaker, Green and Glen Ridge Rds., South Euclid, $30,493 and $8,032 respectively. Noted Aug. 12.

Okla., Pauls Valley—State Bd. Affairs, Capitol Bldg., Oklahoma City, sanitary sewer and septic tank for Pauls Valley Reform School, to Barbour & Short, Norman, $25,624. Est. $33,600. Noted Jan. 1.

Tex., San Antonio—See "Bridges."

Wash., Seattle—Sewers in East 55th St., to Puget Sound Constr. Co., 3014 14th St., $42,562.

B. C., Vancouver—Vancouver & District Joint Sewer Bd., 2 mi. concrete trunk sewers, South Hill Combined Trunk Sewer, day labor, $395,000. E. A. Cleveland, 500 Beatty St., engr.

WASTE DISPOSAL

PROPOSED WORK

Calif., Oakland—City Port Comn., G. B. Hegardt, secy., waste disposal plant, at Peralta Slip, 60 x 150 ft. wharf, 5,100 ft. roadway 24 ft. wide, dredging 140,000 cu.yd. 1,000 lin. ft. sheet pile bulkhead. $100,000. Eng. Dpt. of Owner, engrs.

Mass., Cohasset—Town, W. O. Souther, Town Hall, incinerator. $18,000. Engineer not appointed.

CONTRACTS AWARDED

Mass., Worcester—City, incinerator, Albany St., to Hiler Eng. & Constr. Co., 122 Livingston St., Brooklyn, N. Y., $141,000.

Ont., Sandwich—Incinerator at Robinet and Chippewa Sts., building, to J. L. McRae, 4 Askin Blvd., $9,642; furnace and chimney, to Municipal Incinerator Co., Hamilton, $11,959.

BRIDGES

PROPOSED WORK

Connecticut—State Hy. Dpt., Hartford, Robinson & Steinman, engrs., 117 Liberty St., New York to design and superintend construction bridge between Hartford and East Hartford. $5,000,000.

Tex., Houston—City, c/o W. E. Monteith, mayor, rein.-con. bridge over White Oak Bayou, White Oak Dr. $50,000; bridge over Brays Bayou, 75th St., $40,000. J. M. Nagle, Houston, city engr.

Wash., Seattle—T. D. Hunt, engr. King Co., replacing wooden trestle with 40 and 60 ft. span rein.-con. bridge over Three Tree Point Rd. $25,000.

Wis., Wausau—Marathon Co., J. A. Clark, comr., 4 span, 475 ft. bridge. $270,000. C. S. Kirth, Madison, engr.

Ont., Forest Hill—Village, 200 ft. rein.-con. hy. bridge on Bathurst St., north of Eglinton Ave. at old Belt Line Ry. $60,000. N. MacNicol, Forest Hill, engr.

BIDS ASKED

Calif., Los Angeles—Bd. P. Wks., City Hall, bids about Sept. 29, 2 rein.-con. girder wedge shaped structures, 300 ft. long, to widen existing bridge, also re-aligning roadway, Tunnel Station Bridge, San Fernando Rd. $35,000; bids early in October, 530 ft. rein.-con. bridge, rigid frame type to have one 66 ft. and one 49 ft. spans, remainder to be retaining wall, West and Venice Blvds. M. Butler, 657 City Hall, engr. Noted Sept. 3.

Maryland—Sept. 15, by State Roads Comn., G. C. Uhl, chn., Baltimore, structural steel superstructure for bridge over Deer Creek, Contr. H-126-44, Hartford Co. L. H. Steuart, secy.; adv. E. N.-R. Sept. 10.

Maryland—Sept. 22, by State Roads Comn., G. C. Uhl, chn., Baltimore, concrete girder bridge (1,136 ft. between abutments) on concrete pile substructure over Bohemia River, Contr. Ce-108-27, Cecil Co. L. H. Steuart, secy.; adv. E. N.-R. Sept. 10.

Maryland—Sept. 24, by State Roads Comn., G. C. Uhl, chn., Baltimore, concrete girder bridge, 463 ft. between abutments, on concrete pile substructure, incl. all bascule piers, Contr. D-79-17, Dorchester Co. L. H. Steuart, secy.; adv. E. N.-R. Sept. 10.

Missouri—Sept. 18, by State Hy. Dpt., Jefferson City, bridges in Bates, DeKalb, Gasconade, Lawrence, St. Louis and Vernon Counties. T. H. Cutler, ch. engr.

Mo., St. Louis—See "Contracts Awarded."

N. Y., Buffalo—Sept. 15, by G. S. Minnis, ch. engr. Grade Crossing Comn., 1037 Ellicott Sq., approach work in Amherst St. in connection with eliminating grade crossing Amherst-Tonawanda Sts.

Ohio—See "Streets and Roads."

O., Bedford—Sept. 25, by State Hy. Dpt., O. W. Merrell, dir. hys., Columbus, 1,700 ft. concrete, steel bridge 80 ft. high in center, to span ravine east of Bedford, for Cuyahoga Co. $450,000. J. O. McWilliams, Bedford, engr. Noted Aug. 27.

Texas—See "Streets and Roads."

Tex., San Antonio—See "Contracts Awarded."

CONTRACTS AWARDED

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, 102 ft. concrete barrel arch span, two 46 ft. concrete girder approach span bridge, 26 ft. roadway, two 5 ft. sidewalks over East Branch Eel River, Humboldt Co. and steel bridge, incl. two 70 ft. plate girder, two 50 ft. steel beam, three 30 ft. tower and two 142 ft. truss spans on steel towers, bents, concrete piers, abutments, 24 ft. roadway over Spanish Creek, Plumas Co., to Rocca & Coletti, San Rafael, $86,320 and $92,780 respectively—330 ft. open spandrel arch span bridge, nine 40 ft. girder approach spans, 24 ft. roadway over Bixby Creek, Monterey Co., to Ward Eng. Co., 315 Montgomery St., San Francisco, $203,334—5 rein.-con. bridges on Tipton-Tulare Rd., Tulare Co., and 42 ft. steel stringer removable span bridge with thirty-four 19 ft. timber spans, concrete deck on creosoted pile bents, 40 ft. roadway, two 4 ft. sidewalks over north arm of Newport Bay, Orange Co., to J. S. Metzger & Son 4481 Whittier Blvd., Los Angeles, $43,517 and $65,249 respectively—120 ft. open spandrel arch span bridge with seven 13½ ft. slab approach spans, 34 ft. roadway over Fern Canyon, Los Angeles Co., to Houghton & Anderson 143 Rose St., Los Angeles $28,958. Grand total $520,158.

Indiana—State Hy. Comn., Indianapolis, five 39 ft. 9 in. span rein.-con. girder bridge over Big Four Ry. near Earl Park, Benton Co., to E. F. Smith 2050 South Harding St., Indianapolis, $33,491. Est. $49,241. Noted Aug. 13.

Indiana—State Hy. Comn., Indianapolis, 3 rein.-con. girder bridges, one over Wildcat Creek, one over Honey Creek, other over Little Wildcat Creek, Clinton and Howard Counties, to E. R. Campbell, Sandborn, $16,689 est. $23,702; rein.-con. girder bridge over Hoffman Branch, steel truss bridge over Yellow River, rein.-con. arch bridge over Yellow River, Marshall Co., to Bremen Dredge & Excavating Co., Bremen, $21,923 est. $33,015. Noted Aug. 13.

Kan., Kansas City—City Clerk, rebuilding bridge damaged by fire, concrete surfacing roadway, to Kansas City Structural Steel Co., 21st St. and Metropolitan Ave., Kansas City, for City, City Public Service Co., Chicago, Rock Island & Pacific R.R. Co., La Salle St. Sta., Chicago, Ill., W. H. Peterson, ch. engr., Kansas Terminal Ry. Co., Union Station, Kansas City, Mo., J. V. Hanna, ch. engr., and Union Pacific R.R., 1416 Dodge St., Omaha, Neb., H. C. Mann, ch. engr. $57,625 base bid. Est. $62,500. Noted Aug. 14.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., concrete substructure for bridge over Connecticut River, Gill and Erving, to Simpson Bros., 77 Summer St., Boston, $102,262. Noted Aug. 13.

Mass., Boston—City, Dpt. P. Wks., J. A. Rourke, comr., concrete, steel bridge over Boston & Albany R.R. on Albany St., to Hill & Delaney, 108 Mass Ave., $19,550. Est. $40,000. Noted Aug. 12.

Mass., Great Barrington—Dpt. P. Wks., Boston, A. W. Dean, engr., steel, concrete bridge over Housatonic River, bituminous approaches, to Fred T. Ley Co., 1215 Main St., Springfield, $32,058. Est. $75,000. Noted Aug. 27.

Mass., Quincy—City, Dpt. P. Wks., rein.-con., steel bridge Beale St., to Thomas Mulcare, Inc., 65 Western Ave., Allston, $18,761. Est. $25,000. Noted Aug. 20.

Miss., Columbus—Columbus & Greenville R.R. Co., Columbus, G. S. Gaines, secy. and treas., replacing present bridge with new and heavier steel bridge incl. two 150 ft. fixed spans, one 286 ft. swing span, fabricating and erecting steel, over Yazoo River at Fort Loring, to Virginia Bridge & Iron Co., Roanoke, Va. False work and altering piers of existing bridge, will be done by company forces.

Mo., St. Louis—Terminal Railroad Assn., H. J. Pfeifer, ch. engr., Union St., rein.-con., steel single-track bridge on Terminal Railroad Belt Line over Pennsylvania Ave., own forces, $60,000.

New Jersey—State Hy. Comn., Trenton, 2 bridges in Hasbrouck Heights and Maywood Boros, in Bergen Co., to G. M. Brewster, Bogota, $86,246. Noted Aug. 13.

New York—A. O. Smith, hy. supt. at office Bd. Supervs. Suffolk Co., Riverhead, superstructure Shelter Island-Sag Harbor Bridge, near Shelter-Sag Harbor, Island-Greenport Bridge, near Greenport, to John A. Roebling's Sons Co., Broad and Canal Sts., Trenton, N. J., $1,299,919. Noted Aug. 13.

N. Y., Buffalo—W. Rathman, comr. P. Wks., concrete founds., sidewalks, gunite, floor arches and beam protection, paving for repairing and reconstructing viaduct, Seneca St., to W. Franklin, Jackson Bldg., $74,900—structural steel for same viaduct and reconstructing viaduct at Elk St. and Abbott Rd., to E. P. Lupfer Corp., Ellicott Sq., $37,500 and $63,600 respectively—reconstructing 107 ft. truss span over Erie R.R. tracks, structural steel work, concrete sidewalks, asphalt paving, to Independent Bridge Co., Neville Island, Pittsburgh, Pa., $28,840. Grand total $204,690.

New York and **New Jersey**—Port of New York Authority, 80-90 8th Ave., New York, flood-light towers on Fort Lee side, George Washington Bridge over Hudson River, to Auf der Heide Contg. Co., West New York, N. J., $40,590.

Ohio—O. W. Merrell, dir. hys., Columbus, south abutment 3 river spans, Piers 2 and 3 and half of Pier 1, of 4-span deck steel girder bridge over Baltimore & Ohio R.R. and Hocking River at south edge Athens, incl. two 80 ft. and two 64 ft. spans, 34 ft. roadway, Sect. "B" Athens-Pomeroy Rd., Athens Co., to C. R. Boulton, 10 East Town St., Columbus, $161,359.

Pennsylvania—See "Railways."

Pennsylvania—State Hy. Dpt., Harrisburg, 359 ft. viaduct, 24 ft. rein.-con. bridge, 7,270 lin.ft. rein.-con. approach pavement, 92 ft. plate girder single span bridge, 30 ft. roadway, 5 ft. sidewalk, over railroad tracks, Route 69 and 251, East Franklin Twp., Kittanning and Applewold Boros, Armstrong Co., incl. 351,000 lb. plain steel bars, 189,300 lb. fabricated structural steel, to Welsh Constr. Co., 2331 Los Angeles Ave., Pittsburgh, $192,960. Noted July 30, under "Streets and Roads."

Tenn., Memphis—City Council, W. Overton, mayor, general contract 2,300 ft. rein.-con. viaduct over Union R.R. at Summer Ave. near Bingham, to S. & W. Constr. Co., Shrine Bldg., $145,000; electric wiring, to Fowler Electric Co., 118 Monroe Ave., $4,100. Noted July 30.

Tex., San Antonio—City, 2 concrete, steel bridges, $40,000 each, extending and paving streets, sewers, 4 duct conduit, gas and electric lines, straightening river, separate contracts. Total est. $200,000.

Wisconsin—State Hy. Comn., and Manitowoc Co. Hy. Com., Green Bay, 22nd Street Bridge, S.P. 3343, to Worden-Allen Co., Port Washington Rd., Milwaukee, $127,296. Noted Aug. 20.

Que., Laprairie — Provincial Govt., Dpt. P. Wks., one 35 ft. and two 50 ft. span bridge over "LaTortue River," Lamarche, to C. Baillargeon, St. Lambert, $19,000. Noted Aug. 27.

STREETS AND ROADS

BIDS ASKED

California—Sept. 16, by C. H. Purcell, engr. State Hy. Comn., Sacramento, untreated crushed gravel or stone surfacing 8.9 mi. road between Redwood and Willow Creeks, Humboldt Co., grading, concrete and asphaltic concrete surfacing 4.3 mi. road between Fullerton and westerly boundary line, Orange Co.

Calif., Gilroy—E. F. Rogers, city clk., taking bids curbing, guttering, sidewalks, asphaltic concrete paving 105,577 sq.ft. Martin Lane, Monterey St., et al.

Calif., Los Angeles—Sept. 21, by Bd. Supervs. Los Angeles Co., grading, drainage structures, shaping, curbing, guttering, 61,997 sq.ft. 1½ in. oiled macadam shoulders, 241 ft. concrete retaining wall, 4 in. oiled macadam on D.R. base paving 123,293 sq.yd., 2 in. asphaltic wearing surface, paving 247,225 sq.ft. Foothill Blvd. from Lorraine to Grand Aves., partly in city of Glendora. To exceed $25,000. G. W. Jones, Hall of Records, Bldg., engr.

Calif., Oakdale—Sept. 21, by City Council, grading, curbing, sidewalks concrete and asphaltic concrete paving 122,500 sq.ft., F. St.

Calif., Santa Clara—A. J. Cronin, city clk., taking bids grading, curbing, sidewalks, asphaltic concrete paving Clay and Grant Sts., et al. To exceed $50,000.

Delaware—Sept. 22, by State Hy. Dpt., Dover, grading, concrete sidewalks, concrete on broken stone base course surfacing 1,500 cu.yd. Contr. 203, Philadelphia Pike—Widening at Claymont.

La., Leesville—Sept. 25, by J. O. Fountain, pres. Police Jury Vernon Parish, grading, drainage structures, gravel surfacing 11.5 mi. Simpson-Seiper Hy., Project 817-A, Route 322.

Maryland—Sept. 15, by State Roads Comn., G. C. Uhl, chn., Baltimore, sheet asphalt paving 0.22 mi. Contr. BC-109-72 Baltimore City—concrete paving 1.36 mi. Contr. T-44-24 Talbot Co.—1 mi. Contr. Wo-103-14, Worcester Co.—macadam paving 0.84 mi. Contr. W-100-07, Washington Co.—penetration slag macadam resurfacing 4.68 mi. Contr. Wi-56-14, Wicomico Co. L. H. Steuart, secy.; adv. E. N.-R. Sept. 10.

Massachusetts—Sept. 15, by Dpt. P. Wks., A. W. Dean, engr., Boston, bituminous macadam paving, incl. rein.-con. bridge, 246 ft. by Lynfield and Wakefield—bituminous macadam paving 1.780 ft. Townsend—3,614 ft. Medway—3,730 ft. Saugus—rein.-con. paving 4,967 ft. Randolph—improving 3,500 ft. Pedham.

Mass., Gloucester—See "Contracts Awarded."

Mass., Saugus—See "Contracts Awarded."

Michigan—Sept. 15, by J. T. Sharpensteen, div. engr. Escanaba, grading, shaping, drainage structures, 2 course gravel surfacing 10.531 mi. FO2-18, Contr. 1, Alger Co. and 4.276 mi. MO27-19 C-2, Gogebic Co., for State Hy. Comn., Lansing.

Constr. News page 98

Streets and Roads (Continued)

Mich., Grand Rapids—Sept. 15, by Kent Co. Road Comn., 1500 Scribner Ave., grading, shaping, drainage structures, concrete paving 4.14 mi. West River Rd. O. S. Hess, Grand Rapids, co. engr.

Missouri—Sept. 18, by State Hy. Dpt., Jefferson City, improving roads in Adair, Bates, Buchanan, Butler, Callaway, Crawford, DeKalb, Dent, Gasconade, Greene, Iron, Lawrence, Linn, Madison, New Madrid, Nodaway, Salina, Stone, Reynolds, St. Louis and Vernon Counties. T. H. Cutler, ch. engr.

N. J., Freehold—Sept. 23, by Bd. Freeholders Monmouth Co., Court House, grading, 9 in. rein-con. paving 45,698 sq.yd. Route 36, Sect. 1, Keyport-Keansburg Rd., Monmouth Co. G. K. Allen, Jr., Red Bank, co. engr.; adv. E. N.-R. Sept. 10.

N. Y., Brooklyn—Sept. 16, by H. Hesterberg, pres., Brooklyn Boro, Boro Hall, grading, bituminous concrete paving Madison Pl., Avenue W, East 18th, East 26th, East 31st, East 25th, Hubbard Sts.—grading, flagging, aspahlt on 6 in. concrete paving Avenue K, East 17th, East 37th, Elton and West 4th Sts.—grading Stanley Ave.

North Carolina—Sept. 15, by State Hy. Comn., Raleigh, grading, sand asphalt surfacing 12.108 mi. P.1131, Chowan Co.—clearing, grubbing, drainage ditches, grading, sand asphalt surfacing 106,910 sq.yd. P.3201, Brunswick Co.—grading, concrete paving 66,400 sq.yd. P.4161, Durham Co.—6,669 sq.yd. bridge approaches. P.5321 Guilford Co.—concrete paving Route 10, P.5050, Alamance Co.—grading, clearing, grubbing, asphaltic concrete paving 2.513 mi. P.5340, Guilford Co.—clearing, grubbing, drainage ditches 1.879 mi. P.7740 Watauga Co.

Ohio—Sept. 11, by O. W. Merrell, dir. hys., Columbus, grading, drainage structures, bituminous macadam, sheet asphalt, brick or concrete paving 13.342 mi. hys. in Crawford, Franklin, Ottawa and Seneca Counties. $516,775; concrete slab bridges in Defiance, Franklin, Hamilton and Trumbull Counties. $18,438.

Pa., Oil City—Sept. 15, by C. S. Hetrick, city clk., City Bldg., curbing, guttering, rein.-con. paving 6,160 sq.yd. or brick paving 5,320 sq.yd. Plummer St. from Park Road to city line. B. B. Weber, City Hall, engr.

Tenn., Memphis—City Council bids about Sept. 8 or 15, concrete paving 8,500 sq.yd. North 3rd St. from Bickford to Cedar Sts. $30,201. W. B. Fowler, City Hall, engr.

Texas—Sept. 21, 22 and 23, by G. Gilchrist, state hy. engr., Austin, construction 40 hy. projects 431.66 mi., incl. 91.93 mi. concrete and 23 bridge projects Est. $4,500,000.

Virginia—Sept. 22, by State Hy. Comn., Richmond, grading, draining 1.3 mi. Project 479—concrete surfacing 3 mi. Project 652—2 bridges Project 640—1 bridge Project 658; adv. E. N.-R. Sept. 10.

Wash., Kelso—Sept. 15, by Bd. Comrs. Cowlitz Co., permanent construction 5.1 mi. West Side Permanent Hy. Prospect 17. $55,000. F. C. Cramer, Kelso, engr. Noted Sept. 3.

Wash., Olympia—Comrs. Thurston Co., bids about Oct. 28, paving Olympia-Yelm Hy. $50,000. N. R. McKay, Olympia, co. engr.

Wisconsin—Sept. 15, by State Hy. Comn. and Hy. Coms. Monroe, LaCrosse, Calumet, Winnebago and Bayfield Counties, Madison, concrete paving 137,000 sq.yd. Camp Douglas-Tomah-Sparta Rd., U. S. Hys. 12 and 16, F.A.P. 325 F and D, Monroe Co.—grading Green Acres Overhead Approaches, S.T. Hy. 33, S.A.P. 5276, LaCrosse Co.—West Hayton Overhead Approaches, S.T.H. 31, S.A.P. 3405, Calumet Co. —0.301 mi. Oshkosh Overhead Approaches, S.T.H. 26, S.A.P. 3118-A, Winnebago Co.—0.447 mi. Siding 190 Overhead Approaches S.L.T. 26, S.A.P. 8242, Winnebago Co.—0.564 mi. West Forest Junction Overhead Approaches, U. S. Hy. 10, S.A.P. 3388, Calumet Co.—Drummond Grade Separation Rd., S.T.H. 24, S.A.P. 8441 and 8448, Bayfield Co.

Ont., London—See "Contracts Awarded."

Ont., Ottawa—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Indio—Curbing, guttering, 3 in. road mix cut-back asphaltic paving 300,000 sq.ft. Street Impvt. 1911, to G. Herz & Co., 311 Platt Bldg., San Bernardino, $28,902.

Calif., Inglewood—Bd. P. Wks., City Hall, grading, curbing, guttering, sidewalks, 8 in. asphaltic paving 475,000 sq.ft. Redondo Blvd., to G. H. Oswald, 366 East 58th St., Los Angeles, $88,360.

Colorado—State Hy. Dpt., Denver, grading, drainage structures, concrete paving 4.544 mi. State Hy. 6, Bent Co., to Driscoll Constr. Co., Pueblo, $94,399; gravel surfacing 6 mi. State Hy. 4, Kit Carson Co., to Bedford & Woodman, $31,426.

Colo., Denver—Dpt. Impvts. & Parks, asphalt paving West 11th Ave. from Bway to Spear Blvd. and Delaware St. from West 11th to West Colfax Aves. Paving Dist. 244, to J. Bertrand Constr. Co., Union Station, $40,043.

Connecticut—J. A. Macdonald, state hy. comr., State Office Bldg., Hartford, to N. Gena, Waterbury, improving Winchester and Haystack Mountain Roads, Norfolk; Barbour Town and East Hill Rds., Canton; Carmel Hill, Nonnewaug Rd. and Munger Lane, Bethlehem—to K-Rect Installation Co., Hartford, Mine Hollow Rd., Southington; Jones Hollow and West Roads, Marlboro—to B. S. Hurd, Monroe, Center St., Adamas Rd. and Westport Turnpike, Easton—to P. Bacco, 33 Bank St., Stamford. Sanfordtown Rd., Redding—to Mariani Constr. Co., 59 Center St., New Haven, Marion Ave., Brooksvale and Cock Hill Rds., Cheshire—to J. R. Wood, Chester, Bokum Hill Rd., Essex—to N. Benvenuti & Son, 6 Elm St., New London, Shewville, Cider Hill, Gallup Hill, Center Groton, Clyde's Flats, Babcock Hill-Stoddard's wharf and Long Cove Rds., Ledyard—to John DeMichiel & Bro., 58 High St., Torrington, Wickett St., West Hill, Joe Gillette and Harwinton Rds., New Hartford and Allen, Brandy Hill and Burrville Rds., Torrington—to V. & H. Trucking Co., North Main St., Seymour, 7 sections, Oxford—to F. D. Miller, Poquetanuck St., Norwich, 5 sections, Preston—to L. Suzio Constr. Co., State and Brooks Sts., Meriden, Tickner's Corner around Twin Lakes, Salisbury—to D. Maselli & Sons, Bloomfield, Cider Mill, Tolland Turnpike, Mill Hill and Shenipsit Rds., Tolland—to Innes Bros., Inc., Clay St., Thomaston, Town Hill, Curtis, Rabbitt Hill, North, Atwood and Wilson Rds., Warren and Lake—to Ahern & Jarvis, 416 Center St., South Manchester, Stafford Hollow, Staffordville and Springfield Rds., Stafford. Noted July 30 and Aug. 10.

Idaho—State Hy. Dpt., Boise, grading, drainage structures, surfacing 5.043 mi. state hy. between Eagle and Meridian, S.A.P. 192-B, Ada Co, to H. F. Cornell, Boise, $34,150.

Ill., Benton—Franklin Co., 4 in. gravel paving 2.014 mi. State Route 14, Sect. 2-M-F-T, 18 ft., with 6 ft. earth shoulders, to Simpson & Feurer, Marion, $21,399. This corrects report published Aug. 27, under Fenton, Ill.

Ill., Bloomington—McLean Co., gravel surfacing 3.0358 mi. Sect. Q-M.F.T., to Rowe & Gibson, Bloomington, $14,318—5.5375 mi. Sect. L-M.F.T., to Berenz & Son, Bloomington, $32,713—4.9049 mi. Sect. M-M.F.T., to Ward, Prothero & Co., Bloomington, $26,577. Grand total $73,608. Noted Aug. 13.

Ill., Jerseyville—Jersey Co., 6 in. gravel surfacing 1.583 mi. State Aid Route 2, Sect. 3, M.F.T., 18 ft., 16 ft. earth shoulders, to H. A. Grabbe, Alton, $15,662; 1.3098 mi. State Aid Route 3 and 3-C, Sect. 1, 18 ft., 6 ft. earth shoulders, to E. J. Varney, Jerseyville, $6,727.

Ind., Crown Point—Lake Co., concrete surfacing 3 mi. N. G. Austgen Rd., to A. C. Proudfoot Constr. Co., Hammond, $58,500. Est. $90,000.

Ind., Terre Haute—Vigo Co., concrete surfacing R. G. Weber Rd., Harrison Twp., to Foulkes Contg. Co., 705½ Ohio St., Terre Haute, $12,547 est. $16,234—brick surfacing Charles Smith Rd., Harrison Twp., to J. A. Shepherd, 1802 South 10th St., $10,287 est. $11,705—gravel surfacing 3 mi. Claude Tobey Rd., Riley Twp., to J. H. Yaw, Terre Haute, $9,946 est. $13,203—1.5 mi. William Schommer Rd., Honey Creek Twp., to N. L. Robertson, Terre Haute, $8,475 est. $16,094. Grand total $41,255. Noted Aug. 13.

Ia., Toledo—Tama Co., gravel surfacing 13.25 mi. trunk roads to Kreige Constr. Co., Marshalltown, $11,265, and to Builders Material Co., 601 South 3rd St., Cedar Rapids, $13,051.

Louisiana—State Hy. Comn., Baton Rouge, to Bishop & Weir, Baton Rouge, gravel surfacing 4.205 mi. road in Franklin Parish, $9,981—to O. M. New, Little Rock, Ark., 3.705 mi. Bienville Parish, $2,579; grading, drainage structures 10 mi. Winn Parish, $18,370—to S. B. Boyd, Columbia, grading, drainage structures, gravel surfacing 9.973 mi. Natchitoches Parish, $33,076—to Clark & McCaa, Jackson, Miss., 7 mi. Ouachita Parish, $27,326—to Dawson & Hunter, Morganza, 6.465 mi. Pointe Coupee Parish, $41,401—to Delony & Tatom, Duback, 3.534 mi. Bienville Parish, $18,503; grading, drainage structures 6.391 mi. Lincoln Parish $23,806—to Dixie Development Co., Inc., Alexandria, grading, drainage structures, gravel surfacing 10.708 mi. Rapides Parish $22,911—to I. M. Goldberg, Abbeville, 2.827 mi. Project 832 $13,302, 6.606 mi. Project 804-A, $32,439, both Vermilion Parish; grading, drainage structures, shell surfacing 3.41 mi. St. Martin Parish $23,090—to Halbert & Williams Co., Inc., Delhi, grading, drainage structures, gravel surfacing 5.933 mi. Franklin Parish $23,568—to F. D. Harvey & Co., Jonesboro, 5.006 mi. Madison Parish $20,968; grading, drainage structures 7.243 mi. La Salle Parish $27,565—to Hoffman & Jones, Madisonville, 5.915 mi. Ascension and Iberville Parishes $48,016; grading, drainage structures, gravel surfacing 7.196 mi. Avoyelles Parish $33,202; grading, drainage structures, shell surfacing 3.977 mi. La Fourche Parish $25,776—to Hennington Bros., Tallulah, grading, drainage structures 5.2 mi. Madison Parish $23,869; local iron ore and gravel surfacing 8.3 mi. Jonesboro-Midway Church Hy., $7,394; 5 mi. Jonesboro-Walker Hy., $4,828, both Jackson Parish—to L. Kirby, Jonesville, grading, drainage structures gravel surfacing 6.629 mi. Concordia Parish $31,178—to R. E. Merrill, Baton Rouge, 5.938 mi. Franklin Parish $22,116—to Robinson Constr. Co., Centerville, Miss., 5.098 mi. Caldwell Parish $20,018—to Shruptine Constr. Co., Oakdale, 5.527 mi. St. Landry Parish $20,605—to R. C. Webb, Delta, Route 587 Tensas Parish $25,115—to Sullivan, Long & Haggerty, Bessemer, Ala., 3.657 mi. Project 799-A, Tensas Parish $14,209; 5.062 mi. Concordia Parish $17,989—to Lawrence Bros., Hilly, 8.055 mi. Project 256-A $16,534; grading, drainage structures 4.396 mi. Project 821-A, $11,485, both Lincoln Parish—to J. H. Reeves, Many, grading, drainage structures, gravel surfacing 7.605 mi. Red River Parish $29,370; 9.203 mi. Allen Parish $46,471; 5.644 mi. Sabine Parish $28,893; grading, drainage structures 7.47 mi. Natchitoches Parish $18,569; 5.954 mi. De Soto Parish $27,658; 9.965 mi. Sabine Parish $34,700—to Wimberly Constr. Co., Arcadia, grading, drainage structures, gravel surfacing 7.134 mi. West Carroll and Richland Parishes, $40,105. 6 mi. Franklin Parish $44,877; grading, drainage structures, local iron ore surfacing 7.199 mi. Bossier Parish $23,410—to J. G. Newkirk, Farmersville, 9.361 mi. Union Parish $51,039—to W. H. Williams, Arcadia, 6.573 mi. Webster Parish $16,889—to Britt & DeLaughter, Broughton, Ark., grading, drainage structures 5.996 mi. Union Parish $15,576—to Forcum, James Co., Dyersburg, Tenn., 10 mi. Caldwell and Winn Parishes $48,198—to Harvey & Jones, Jonesboro, 4.498 mi. Jackson Parish $12,548—to Hunter & Drew, Minden, 7.777 mi. Ouachita Parish $20,450; 9.312 mi. Winn Parish $35,848—to Robinson & Young, Baton Rouge, 6.497 mi. Ascension Parish $20,097—to W. D. Womack, Chatham, 6.97 mi. Jackson Parish $18,028—to Union Paving Co., Baton Rouge, concrete surfacing 5.833 mi. Vermilion Parish $109,358—to W. T. Burton Co., Sulphur, asphaltic surface treating 6.46 mi. St. Martin and St. Landry Parishes, $76,392. Grand total, $1,379,695. Noted Aug. 14.

Me., Portland — City, granite block paving 3.515 sq.yd. Deering Ave., to B. Bucci, Portland.

Maryland—Dpt. P. Wks., State Roads Comn., Baltimore, macadam paving 1.34 mi. Contr. B-213-44, Baltimore Co., to H. T. Campbell & Sons Co., Towson, $24,981. Noted Aug. 13.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 4.03 mi. Contr. H-117-42, Harford Co., to Harry T. Campbell & Sons Co., Towson, $77,850.

Massachusetts—Dpt. P. Wks., Boston, A. W. Dean, engr., bituminous macadam paving 4,763 ft. hy. Brockton, to Powers Bros., Brockton, $36,041—1,520 ft. Brookfield, to Frank & Frank Constr. Co., 9 Doyle Ave., Providence, R. I., $10,505—2,300 ft. Seekonk, to T. J. Quinn & Son, Ashton, R. I., $12,567—gravel and bituminous macadam paving 4,825 ft. Randolph, to E. Barolonr, 34 Butler St., Maynard, $10,426—bitulithic concrete paving 900 ft. Concord, to Greenough Constr. Co., 200 Calvary St., Waltham, $4,129—rein.-con. paving 3,100 ft. Framingham, to B. Perini & Sons, Ashland, $27,079. Grand total $100,747. Noted Aug. 20.

Mass., Boston—Dpt. P. Wks., sheet asphalt paving sewerage works, Prebble St., Ward 7, to A. R. Doyle, 44 Perkins St., Jamaica Plain, $46,415.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Woodstock Ave., Brighton, to Marrinucci Bros., 259 Quincy St., Roxbury. Est. $25,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., recut granite block paving Northern Ave., Ward 6, to S. J. Tomasello, 15 Bay St., Dorchester. $50,227.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Westmount Ave., Ward 20, to C. Frangioso & Son, 622 Cummings Hy., Mattapan. Est. $25,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., bituminous paving Gladstone St., East Boston, to B. F. Hanrahan, 26 Bennington St., East Boston; Lewis St., East Boston, to Baker-Matz Co., 1578 Tremont St., Roxbury. Est. $25,000. Noted Aug. 13.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., artificial stone sidewalks in Jamaica Plain, Roslindale and West Roxbury, to W. G. C. Co., 27 School St. Est. $25,000.

Mass., Brookline—Bd. Selectmen, granolithic sidewalks on Aspinwall Ave., to F. L. Love, 29 Loveland Rd., at $1.39 per foot. Est. $25,000 or more.

Mass., Cambridge—Metropolitan Dist. Comn., 20 Somerset St., Boston, resurfacing Memorial Dr. southerly roadway, to John McCourt, 910 Huntington Ave., Boston, $51,445.

Mass., Cambridge—Street Dpt., 2 in. sheet ashpalt paving, to Simpson Bros., 77 Summer St., Boston, $1.48 per sq.yd. Est. $25,000. Noted Aug. 13.

Mass., Gloucester—Street Dpt., paving, sidewalks, edgestones on Riverside Ave., separate contracts. $25,000.

Mass., Saugus—Dpt. P. Wks., granolithic sidewalks, curbing, separate contracts. Est. $25,000.

Michigan—H. G. Oakes, div. engr., Plymouth, grading, shaping, drainage structures, concrete paving 0.545 mi. MO63-24C-7, Oakland Co. and 3.228 mi. Project 050-6, Contr. 2, Macomb Co., to J. A. Mercier Co., 450 West Fort St., Detroit, for State Hy. Comn., Lansing, $29,528 and $113,876 (incl. cement) respectively. Noted July 23 and 30.

Michigan—H. G. Oakes, div. engr., Plymouth, grading, shaping, drainage structures, concrete paving, 3.671 mi. M063-24C-7, Oakland Co., to J. A. Mercier Co., 450 West Fort St., Detroit, $198,891.

Miss., Vicksburg—Concrete paving, to V. T. Zollinger, Vicksburg, $33,712.

Nebraska—Dpt. P. Wks., Lincoln, grading 11.3 mi. Loup Co., to J. E. Tift, Omaha, $41,804 — 11.4 mi. Crookston-Valentine Rd., F. A. P. 202 and oiled sand gravel surfacing 5.7 mi. Woodlake-Valentine Rd., F. A. P. 317-D,

Constr. News page 100

Streets and Roads (Continued)

both Cherry Co., to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, $38,434 and $34,366 respectively—oiled sand surfacing 5.7 mi. Woodlake-Valentine Rd., F. A. P. 317-B, Cherry Co., to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, $51,940—paving in McCook Co., to McCook Cement & Stone Co., McCook, $30,832. Grand total $197,376. Noted Aug. 19.

N. J., Newton—Bd. Freeholders Sussex Co., Court House, grading, graveling Fairview Lake Rd., to R. Bossert, 208 1st St., Newark, est. $25,000; grading, bituminous macadam paving Lake Lackawanna Rd., to W. A. Fergusons Sons, Riverview Dr., Totowa, $19,971.

N. J., Newton—Sussex Co., Court House, grading, rein.-con. paving Newton Sparta Rd., to Sost Contg. Co., 305 Whitford Ave., Nutley, $63,276. Noted Aug. 20.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, paving Genesee Ave., to J. Johnson Sons, Inc., 455 Bway., West New Brighton $20,006; Ridgewood Ave., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $22,527. Noted July 9.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro., Boro Hall, paving Arthur Kill Rd., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $25,808. Noted July 16.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, bituminous concrete paving Amboy Rd., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $32,048. Noted Aug. 19.

N. Y., Yorktown — Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading, paving 3.95 mi. Bronx Parkway Extension, to J. W. Arborio, Cedar St., Poughkeepsie. Noted July 9.

Ohio—O. W. Merrell, dir. Hys., Columbus, grading, concrete paving 0.568 mi. Sect. "R" Big Four Grade Separation Dayton-Springfield Rd., Clark Co., to P. Nill, Dayton, $31,976; concrete paving 0.304 mi. Sect. "C-1 Penna Subway" Columbus-Wooster Rd., Knox Co., to C. Huth, Tiffin, $8,526.

O., Canton—Berea granite curbing, brick paving Rowland Ave. N.E., to Garaux Bros. Co., 415 9th St. S.W., $35,892. Est. $57,151.

O., Columbus — R. S. McPeak, dir. Serv., grading, drainage structures, laying water and sewer connections, asphalt paving 8,260 sq.yd. Minnesota Ave., from Dresden St. to McGuffy Rd., and grading, curbing, drainage structures, laying water and sewer connections, sheet asphalt paving 8,450 sq.yd. Manchester St. from Dresden St. to McGuffy Rd., to Cleveland Trinidad Paving Co., Grand Theatre Bldg., $17,244 and $19,645 respectively.

O., Columbus—Franklin Co., F. D. Connally, clk., grading, drainage structures, bituminous macadam paving 1.61 mi. Stummel Rd., 2, Franklin Twp., 20 ft., to Cleveland Trinidad Paving Co., Grand Theatre Bldg., $23,181. Noted July 30.

O., Toronto—Town, brick repaving 4th St., to H. M. Bates, Steubenville, $42,891.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage structures 11.126 mi. State Aid Project 791-A and B, 32 ft., south of Sayre, Beckham Co., to Merveldt & Lawson, El Reno, $24,869 est. $30,000; 10 mi. Federal Aid Project 293-G and H, 32 ft., Woods Co., to F. S. Woelke, Enid, $51,620 est. $60,000.

Tenn., Memphis—Concrete paving Bruce St. from Oliver Ave. to north line Southern Ry. property, and Wilson St. from McLemore St. to South Parkway, to Carey-Reed Paving Co., 575 North Front St., $8,869 and $18,382 respectively.

Tex., Brownsville—Cameron Co., c/o O. C. Dancy, judge, concrete paving 8.9 mi. Boca Chica Rd. and dirt work on Morton-Banker Rd. extension of same road, to Dodds & Wedegartner, San Benito, $24,980 and $3,354 respectively; dirt work on Boca Chica Rd. and Coffee Rd. to L. G. Nichols Co., Brownsville, $3,544 and $9,900 respectively. Grand total $41,778. Noted Aug. 13.

Tex., Marshall—City, c/o H. J. Graeser, dir., 1½ in. Duraco cold asphalt on 5 in. concrete surfacing 36,421 sq.yd. to T. L. James & Co., Ruston, La., $102,353. Noted Aug. 6.

Tex., San Antonio—See "Bridges."

Tex., Waco—J. H. Strange, engr., City Hall, 2 in. asphalt on 5 in. rein.-con paving 10,000 sq.yd. South 12th, South 14th, South 16th, South 18th, South 20th, Franklin to Austin Sts., leaveouts on North 12th, North 18th and North 25th Sts. and Lasker Ave., to Central Bithulithic Co., Praetorian Bldg., Dallas, $23,065; rein.-con. paving 5,000 sq.yd. South 4th St. Jackson to Webster Sts., North 26th St., Columbus and Herring Aves., 4th to 5th Sts., to J. E. Johnson Constr. Co., Waco, $11,370. Noted July 30.

Ont., London—W. P. Near, city engr., concrete paving Hamilton Rd. and Ottaway Ave., day labor, for City. $70,000.

Ont., Ottawa — Widening Laurier Ave. W. from Kent to Lyon Sts. $16,000—Kent St. from Laurier Ave. W. to Somerset St., $25,000—Kent St. from Sparks to Wellington Sts., $9,000—Metcalfe St. from Laurier Ave. W. to Lisgar St., $15,000—grading Sherwood Dr. from Fairmont to Parksdale Sts., $10,000—Hamilton Ave. from Carling Ave. to Canadian National Ry., $9,000—Hinton Ave. from Carling Ave. to Canadian National R.R., $9,000—constructing 24 in. sewers Kent St. from Laurier Ave. W. to Cooper St., $55,000—48 in. sewers York St. from Sussex to King Edward Aves., $100,000—Hamilton Ave., $10,000—Hinton Ave., $10,000—Faraday St., $3,000, day labor. Est. grand total $264,000.

Ont., Toronto—Asphalt on concrete paving Pembroke St., to Law Constr. Co., 225 Sterling Rd., $10,738; additional section Avenue Rd., to McNamara Constr. Co., 53 Yonge St., $33,606. Est. $44,345.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Calif., Oakland—See "Waste Disposal."

Mass., Barnstable—J. T. Dickenson, Long Beach Rd., Centerville, timber pier, dredge and solid fill, Centerville Harbor. $25,000. Private plans.

Mass., Nantucket—Citizens Gas & Electric & Power Co., pier, bulkhead, piling, dredging and fill solid in harbor. $25,000 or more. Private plans.

BIDS ASKED

Mass., Fall River—Sept. 8, by City, City Auditor, City Hall, concrete retaining wall between City land and that of Pepperell Mfg. Co.

N. Y., Brooklyn—Sept. 16, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, restoring public beach at Coney Island.

CONTRACTS AWARDED

Ark., Marked Tree—Bd. Comrs. D. D. 7, Poinsett Co., to Vollmer & Sons, Inc., Blytheville, widening floodway to 2 mi. between St. Francis Lake through Poinsett and Cross Counties to St. Francis River, incl. 3,000,000 cu.yd., levees, ditches, hy. embankment, fill removal, etc., levee embankment at $0.114 per cu.yd., spoil bank enlargement $0.09, dams in floodway ditches $0.22, muck ditch $0.08, hy. embankment $0.12, channel excav. $0.07, fill removal $0.06, breaching fills $0.20, spur dykes $0.30. Est. $750,000. Noted Aug. 20.

Idaho, Wallace — Oregon-Washington Railroad & Navigation Co., Pittock Blk., Portland, Ore., rein.-con. retaining wall north of depot, to Clifton-Appleton & Toole, Hutton Bldg., Spokane, Wash., $50,000.

Mass., Lynn—Metropolitan Dist. Comn., 20 Somerset St., Boston, repairing shore protection at Woodbury's Point, Lynn Shore Reservation, to Simpson Bros. Co., 77 Summer St., Boston, $39,520.

Pennsylvania—See "Railways."

Tex., Eagle Pass—Maverick Co. irrigation project, Quemado Valley Sect. of work in progress, most of work will be constructing lateral ditches leading from main canal, to Trinity-farm Constr. Co., Santa Fe Bldg., Dallas, Eagle Pass and Donna, $71,000. Noted Apr. 30.

Wis., Milwaukee—Sewerage Comn., docks, effluent channel, cut-off wall, filling in land in Lake Michigan to be used in connection with extension sewage disposal plant, to E. E. Gillen Co., 228 East Water St., $553,708. Noted Aug. 14.

Bond Elections

Coming Bond Elections

Waterworks Distribution System — Lafayette, Calif., Water Dist., $100,000.
Waterworks Impvts.—Guthrie Center, Ia., Sept. 8, $35,000.
Waterworks, Jefferson Parish, La.—East Jefferson, Waterworks Dist. No. 1, (P. O. Matarie), Sept. 22, $300,000.
Sewerage Extensions — Minden, La., Sept. 22, $70,000.
Power & Light Plant—Crystal City, Tex., about Sept. 26, $128,000.
Schools, New and Additions — San Francisco City and County, November, $5,000,000 to $6,000,000.

Bonds Voted

Waterworks Impvts. — Prescott, Arizona, $200,000.
Waterworks & Sewers—Hollidays Cove, W. Va., $30,000.
Court House and Jail — Gregg County, Tex., $200,000.

Bonds Defeated

Waterworks—Byron, Minn., $12,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., Alameda—AIRPORT—Con. Q. M. soon takes bids 100 x 180 ft. administration building, 334 x 480 ft. main depot supply building, 200 x 440 ft. hangar heating plant, quartermaster warehouse, utility building and garage, pumping station, radio station, fuel oil storage tanks, lighter dock and various other buildings. $743,000. Noted Sept. 3.

Calif., Monterey—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by W. O. Raiguel, Del Monte, U. S. Post Office.

Calif., Stockton—DREDGING—U. S. Eng., Sacramento, 1,289,000 cu.yd. dredging, 26 ft. channel prism.

Fla., Miami—ELEVATOR—Treas. Dpt. at office Sup. Archt., elevator in new U. S. Post Office, Court House and Customs House. Noted Aug. 27.

Ill., Joliet—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by J. E. Coyle, Joliet, U. S. Post Office.

La., Monroe—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., plans by J. W. Smith & Associates, Monroe, U. S. Post Office and Courthouse. Noted Apr. 16.

Me., Sanford—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by J. P. Thomas, 537 Congress St., Portland, U. S. Post Office. Noted Nov. 27.

Mass., Lynn—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by E. H. Hoyt & Associates, and Ripley & Le Boutillier, assoc. archts., 45 Brown St., Boston, Mass., U. S. Post Office. Noted July 9.

Mass., Quincy—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Parker, Thomas & Rice, 177 State St., Boston, Mass., brick, stone addition. $250,000.

Mich., Milan—PRISON—Dpt. Justice plans by Smith, Hinchman & Grylls, 800 Marquette Bldg., Detroit, 2 and 4 story, basement, brick, steel, rein.-con. prison. $400,000.

New Jersey—DREDGING—U. S. Eng., Phila., Pa., 698,000 cu.yd. Delaware River between Delanco and Roebling.

N. Y., Freeport—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Tachau & Vought, 102 East 30th St., New York, U. S. Post Office.

N. Y., New York—DREDGING—U. S. Eng., 1st Dist., 304,350 cu.yd. Westchester Creek.

N. Y., New York—DREDGING—U. S. Eng., 1st Dist., 1,161,200 cu.yd. in Anchorage Channel, Upper Bay, New York Harbor.

O., Cincinnati—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by S. Hannaford & Sons, Dixie Terminal Bldg., 4 story, basement, brick, stone, rein.-con., Liberty and Dalton Sts. $2,800,000.

O., Dayton—ADMINISTRATION, etc.—Con. Q.M., 2 story, brick administration building, $60,000; two 110 x 240 ft. hangars $143,000, concrete paving $51,000 at Wright Field.

Ore., Marshfield—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Johnson & Wallwork, United State Bank Bldg., Portland, U. S. Post Office.

Pa., Ambridge—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, steel, stone, Merchant St. to Melrose Ave. $145,000.

Pa., Grove City—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by W. G. Eckles, New Castle, U. S. Post Office.

Pa., Jeannette—POST OFFICE—Treas. Dpt., at office Sup. Archt., 1 story, basement, 100 x 136 ft., brick, stone, Bullitt Ave. and 5th St. $155,000.

Texas—DREDGING—U. S. Eng., Galveston, 4,760,000 cu.yd. from Houston Ship Channel between Morgan Point and Red Fish Reef.

W. Va., Beckley—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by S. H. Bridge, Beckley, and A. B. Mahood, Bluefield, U. S. Post Office.

BIDS ASKED

Alabama and Mississippi—DREDGING—Sept. 18, by Con. Q.M., Mobile, Ala., 3,400,000 cu.yd. in Gulfport Ship Channel and Anchorage Basin. Noted June 4.

Ala., Montgomery—STABLE—Sept. 28, at office Con. Q.M., 1 stable building for 64 animals at Maxwell Field; adv. E. N.-R. Sept. 10.

Ark., Fayetteville—REMODELING, etc.—Sept. 23, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office; adv. E. N.-R. Sept. 10.

Ark., North Little Rock—POST OFFICE—Sept. 15, by Treas. Dpt. at office Sup. Archt., U. S. Post Office, 4th and Main Sts. Noted July 7.

California—ROAD—Sept. 22, by Pub. Rds., 461 Market St., San Francisco, grading, structures 8.947 mi. Sect. A, Route 5, Yosemite Natl. Park Hy., Mariposa Co.

Calif., March Field—GASOLINE FUELING SYSTEM—Sept. 21, by Con. Q.M. at March Field, gasoline fueling system. Tanks, pipe, fittings to be furnished by owner.

Colo., Monte Vista—POST OFFICE—Sept. 30, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. $115,000.

Ill., Rock Island—LEVEES—Sept. 21, by U. S. Eng. Rock Island, enlarging old levee and

Constr. News page 101

Federal Government (Continued)

constructing new set-back levees in Indian Grave Drainage Dist.; adv. E. N.-R. Sept. 10.

Ind., Noblesville—POST OFFICE—Sept. 22, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. $80,000. Noted June 18.

Kan., Topeka—FOUNDATION—Sept. 14, by Treas. Dpt. at office Sup. Archt., found. for U. S. Post Office, Court House. Total est. $1,065,000. Noted Aug. 6.

Louisiana—LEVEES—Sept. 25, by U. S. Engr., New Orleans, 270,000 cu.yd. in Darrowville Levee, Item L895, Ascension Parish; 580,000 cu.yd. St. Gabriel Levee, Item L868-C, 585,000 cu.yd. same levee Item L868-A, and 585,000 cu.yd. same levee Item L868-A Iberville Parish, all foregoing in Pontchartrain Levee Dist.; 580,000 cu.yd. Item R820, Kelson Levee, West Baton Rouge Parish; 720,000 cu.yd. Solitude-Chamberlain Levee, Item R 828, West Baton Rouge Parish; 650,000 cu.yd. Arbroth-Alford Levee, Item R822-A 650,000 cu.yd. Item R 822 B, 650,000 cu.yd. Item R 822 C, West Baton Rouge Parish; 800,000 cu.yd. Waterloo-Hermitage Levee, Item R 814-R, 800,000 cu.yd. same levee, Item R 814-B both Pointe Coupe Parish; 61,000 cu.yd. Port Allen-Brushley Levee, Item R 842-A, 545,000 cu.yd. Item R 842-B, and 545,000 cu.yd. Item R 842-C, all foregoing West Baton Rouge Parish; 760,000 cu.yd. Item R 848-A, in Missouri Bend Levee, 770,000 cu.yd. Item R848 B, same levee, 770,000 cu.yd. Item T848-C, same levee, 740,000 cu.yd. Item R 831-A, Chamberlain-Lobdell Levee, 740,000 cu.yd. Item 831-B, 730,000 cu.yd. Item R 831-C, 740,000 cu.yd. Item R 831 D, all foregoing in West Baton Rouge Parish, Atchafalaya Front Levee Dist., all jobs in 2nd New Orleans Levee Dist.

La., Shreveport—STEAM DISTRIBUTION SYSTEM—Sept. 25, by Con. Q.M., underground steam and hot water distribution system.

Me., Portland—CLEARING SITE—Sept. 19, by Treas. Dpt. at office Sup. Archt., clearing site for U. S. Post Office. Noted Aug. 6.

Missouri—BANK PROTECTION—See "Contracts Awarded."

Va., Langley Field—FUEL OIL TANK—Sept. 23, by Con. Q.M., 50,000 gal. concrete fuel oil tank and installing boiler plants and outside distribution system for hangar area; adv. E. N.-R. Sept. 10.

Va., Langley Field—WAREHOUSES—Sept. 25, by U. S. Engr., 2 air corps warehouses, $100,000.

W. Va., Huntington—GUIDE WALLS—Sept. 25, by U. S. Engr., increasing heights lower guide walls on Ohio River Locks 23 and 24; adv. E. N.-R. Sept. 10.

CONTRACTS AWARDED

Ala., Attalla—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Adams Constr. Co., 1805 H St. N.W., Wash., D. C. $70,000.

Ala., Montgomery—ROADS, etc.—Con. Q.M., Maxwell Field, concrete roads, curbs, gutters and water extensions at Maxwell Field, to Batson Co., Inc., Birmingham, Ala., $69,044 and $13,270 respectively; drainage system to Hornbuckle Constr. Co., McGlowan-Brown Bldg., Atlanta, Ga., $19,200; outfall sewer, to A. J. Honeycutt Co., Birmingham, $17,069; sanitary sewer, to Carey-Reed Co., Lexington, Ky., $5,871. Grand total $424,454.

Conn., New Haven—DREDGING—U. S. Engr., Providence, R. I., 137,000 cu.yd., to Morris Cummings Dredging Co., 44 Whitehall St., New York, $20,111.

Fla., Key West—BREAKWATER—Spec. 6533—Yards & Docks, Navy Dpt., improving breakwater, to Van Gordon Constr. Co., Jacksonville, $159,000. Noted Aug. 13.

Illinois and Missouri — PILING DIKES — U. S. Engr., 428 Customhouse, St. Louis, Mo., 500 to 1,200 lin.ft. Eliza Towhead, Ill., in Mississippi River, and 1,500 to 3,000 ft. at Commerce Island, Mo., to Badgett Constr. Co., Caruthersville, Mo., $25,225 and $59,964 respectively—500 to 1,200 ft. Harlow Island, Mo., and 2,000 to 3,500 lin.ft. Wilson Island, Mo., to Kansas City Bridge Co., 510 Prear Leslie Bldg., Kansas City, Mo., $27,094 and $64,467 respectively. Grand total $176,750. Noted July 16.

Ill., Cairo—REVETMENT—U. S. Engr., 428 Custom House, St. Louis, Mo., 1,000 to 2,250 ft. revetment in Mississippi River between Miles 7 and 11, above here, to Woods Bros. Constr. Co., 133 South 13th St., Lincoln, Neb., $24,285. Noted Aug. 20.

Ill., Chicago—STEEL—Treas. Dpt. at office Sup. Archt., 48,000 tons steel for U. S. Post Office, to American Bridge Co., 71 Bway., New York, N. Y. Noted Sept. 3, under "Contracts Awarded."

Ill., Havana—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to A. Clement Tobin & Co., Richmond Heights, $47,000. Noted July 30.

Mass., Palmer—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, mezzanine, 95 x 97 ft., brick, steel, Central and Park Sts., to Cianci Constr. Co., 377 Atwells Ave., Providence, R. I., $76,945. Noted July 9.

Miss., Vicksburg—LEVEE—U. S. Engr., 462,000 cu.yd. James Crossing Setback Levee on east bank, and 715,000 cu.yd. Princeton-Carolina Levee, west bank of Mississippi River to Lewis-Chambers Co., Canal Bank Bldg., New Orleans, La., at $0.1525 and $0.145 per cu.yd. respectively; 1,250,000 cu.yd. Old River Set Back Levee and 781,900 cu.yd. Old River Enlargement Levee, to Grasser Contg. Co., Amer. Bank Bldg., New Orleans, La., $0.1115 and $0.18 per cu.yd. respectively.

Missouri—BANK PROTECTION—U. S. Engr., Memphis, Tenn., 5,000 ft. bank protection on Mississippi River near Island 18, above Cottonwood Point, by day labor and government plant. All bids rejected. Noted July 30.

N. Y., Brooklyn — ELEVATOR — Yards & Docks, Navy Dpt., repairing elevators at U. S. Naval Hospital, to Watson Elevator Co., 407 West 36th St., New York, $3,850.

N. Y., New York — POST OFFICE — Treas. Dpt. at office Sup. Archt., superstructure U. S. Parcel Post Building, to G. F. Driscoll Co., 548 Union St., Brooklyn, $5,273,000; structural steel, to McClintic-Marshall, 39 Bway., New York. Noted Aug. 27.

N. Y., New York—TEST BORINGS—U. S. Engr., New York, 200 test borings along centerline of proposed New York Bay-Delaware River Sect. Intracoastal Waterway, to P. J. Healey, Inc., 25 Church St., $425,150. This corrects report in Aug. 20 issue.

Okla., Hobart—POST OFFICE—Treas. Dpt. at office Sup. Archt., concrete, brick, stone, to Upchurch Constr. Co., Montgomery, Ala., $65,000. Noted Aug. 13.

Tenn., Memphis—LEVEE—U. S. Engr., 620,000 cu.yd. earthwork in Enlargement L337, to Lourance Bros. & Co., Driver, Ark., $141,980; 620,000 cu.yd. L338, to C. C. Auderholdt, Memphis, $162,006; 620,000 cu.yd., L336, to Dixie Constr. Co., Box 1148, $112,220; 450,000 cu.yd. L334, to J. B. Turner, 5032 Georgia Rd., Birmingham, Ala., $90,000; 236,000 cu.yd. L33, to R. T. Clark Co., Inc. and Delta Constr. Co., Lake Cormorant, Miss., $44,202, all foregoing in Yazoo Levee Dist. Grand total $550,408.

Texas—DREDGING—U. S. Engr., Galveston, 7,740,300 cu.yd., to Sternberg Dredging Co., Arcade Bldg., St. Louis, Mo., $426,627.

Tex., Crockett—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Samford Bros., Montgomery, Ala., $60,000. Noted Aug. 6.

Utah, Salt Lake City—HOSPITAL—Vet. Bu., Arlington Bldg., radial brick chimney at U. S. Veterans Hospital, to General Concrete Constr. Co., 431 South Dearborn St., Chicago, Ill., $3,935. Noted Aug. 6.

Va., Norfolk — COMPRESSOR — Yards & Docks, Navy Dpt., air compressor at Navy Yard, to Worthington Pump & Mchy. Corp., Homer Bldg., Wash., D. C., $26,500.

Va., Norfolk—RAILROAD—Yards & Docks, Navy Dpt. extension to railroad at Naval Ammunition Depot, St. Juliens Creek, to Tunstall-Johnson Co., Inc., Norfolk, $14,550.

Wash., Klipsan Beach — RADIO DIRECTION FINDER HOUSE—Yards & Docks, Navy Dpt., radio direction finder house, 2 radio masts and repairing roofs of dormitory at Radio Direction Finder Station, to T. L. Mathews, Ocean Park, $2,087.

Constr. News page 102

RAILWAYS

BIDS ASKED

New York—Sept. 23, by Dpt. Mental Hygiene, State Office Bldg., Albany, railroad track and trestle at Pilgrim State Hospital, Brentwood. F. W. Parsons, comr.

CONTRACTS AWARDED

Maryland—Pennsylvania R. R. Co., Broad St. Sta., Phila., Pa., T. J. Skillman, ch. engr., 2 additional main tracks and certain industrial and yard tracks between Gwynns Run Cabin and Loudon Park Cabin, Baltimore, to John F. Casey Co., 1501 Pennsylvania Ave., Pittsburgh, Pa., $298,000.

New Jersey—Pennsylvania R. R. Co., Broad St. Sta., Phila., Pa., T. J. Skillman, ch. engr., concrete founds and guy anchors for catenary supporting and transmission structures on main line from Olden Ave., Trenton, to Millstone Jct. and on Princeton branch from Princeton to Princeton Junction, to Gibbs & Hill, Inc., Pennsylvania Sta., New York, $350,000.

Pennsylvania—Pennsylvania R. R. Co., Broad St. Sta., Phila., T. J. Skillman, ch. engr., furnishing, depositing, dredging material as fill on Pennsylvania R. R. property in vicinity Girard Point Yard, Phila., to Ambler Constr. Co., Phila., $200,000; overhead bridge, at Lititz Pike, Lancaster, to J. H. Wickersham, Lancaster, $34,000.

SUBWAYS AND TUNNELS

PROPOSED WORK

Ill., East St. Louis — Terminal R.R. Assn., 1800 Market St., St. Louis, Mo., H. J. Pfeifer, ch. engr., soon takes bids rein.-con. subway 80 ft. wide to carry Bway. under 9 railroad tracks leading to new union station to be built at Main St. and Brady Ave. and sufficient length to clear tracks and Cahokia Creek. It will replace present viaduct over tracks at Bway. Contract for 3,000 tons structural steel to be used in subway, awarded to Mississippi Valley Structural Steel Co., 3117 Big Bend Blvd., Maplewood, Mo.

GRADE CROSSINGS

PROPOSED WORK

Calif., Los Angeles—See "Bids Asked."

N. Y., Erwin—Eric R.R. Co., G. S. Fanning, ch. engr., 101 Prospect Ave. S.W., Cleveland, O., bids late in fall, eliminating Kelly or Gee Crossing, Steuben Co., near here. $184,500. Noted Dec. 26, 1929.

N. Y., Hoosick—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, Mass., eliminating Main Street Crossing, Rensselaer Co. $101,100.

Texas—State Hy. Comn., W. R. Ely, chn., Austin, steel, concrete underpass, approaches on Hy. 70, Federal Aid Project 511-A, Nolan Co.; steel, concrete overpass over Panhandle & Santa Fe Ry., Hy. 4, Federal Aid Project 45 Reopened, Sect. D, Wheeler Co. G. G. Wickline, Austin, bridge engr.

Texas—State, Baird Co. and Texas Pacific R.R., C. F. Mitchell, ch. engr., Dallas, 140 ft. rein.-con. underpass, 24 ft. wide on Hy. 1 $25,000. G. Gilchrist, State Hy. Dpt., Austin, engr.

Tex., Brownwood—Brown Co., 240 ft. rein.-con. overpass, 24 ft. wide, grading, drainage structures, 0.857 mi. Federal Aid Project 583-B. $40,000. L. Ehlinger, Box 210, resident engr.

BIDS ASKED

Calif., Los Angeles—Bd. P. Wks., City Hall, taking bids concrete piers, retaining walls, other concrete work in connection with 1st Street and Glendale Grade Separation, $100,000. Plans later 950 ft. steel superstructure with 200 ft. main arch to carry traffic over the intersection. $200,000. M. Butler, City Hall, engr.

CONTRACTS AWARDED

Calif., El Rio—Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., highway subway under tracks, 10 mi. west of here, to Merritt-Chapman & Scott Corp., San Pedro, $72,000.

New Jersey—Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr. Hoboken, N. J., 3 bridges to carry railroad's track over New Jersey State Hy. 30, at Washington and Hampton, to Rust Eng. Co., 30 Church St., New York.

Ohio—O. W. Merrell, dir. hys., Columbus, reconstructing existing separated crossing over New York Central R.R., Sect. "V" Milan-Elyria Rd., Lorain Co., to Dodge-Hussey Co., 174 West 5th Ave., Columbus, $65,526.

Wisconsin—State Hy. Comn., Madison, constructing Cedar Grove Grade Separation Approaches Sheboygan Co., to Muth-Knetchel Constr. Co., Manitowoc, $8,133; Burlington Grade Separation, Racine Co., to Whitewater Bridge Co., Whitewater, $9,844; Monegan Overhead Approaches, LaCrosse Co., to Williams & Williams, Strum, $24,917; Ryan Grade Separation, Milwaukee Co., to R. Van Vechten, 2065 South 18th St., Milwaukee, $10,340; Fonda Grade Separation Approaches, to Froemming Bros., Inc., 1326 Humboldt Ave., Milwaukee, $11,050; amiesite asphalt paving 11.3 mi. Pembine-Niagara Rd., Marinette Co., to J. P. Humphries, Milwaukee, $120,590; concrete paving 1.7 mi. Lancaster-Platteville and Lancaster-Beetown Rds., to W. J. Lang Constr. Co., 7 South Dearborn St., Chicago, Ill., $43,530; 5.147 mi. Milwaukee-Chicago Rd., Milwaukee Co., to J. R. Griffith, Racine, $299,576. Grand total $527,980.

DAMS

BIDS ASKED

Wash., Seattle—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

Calif., Oakland—WHARF, etc.—See "Waste Disposal."

Tex., Houston—WHARF IMPROVEMENTS—Parker Bros. Co., Inc., 1102 Holly St., c/o Wm. Parker, wharf and mat storage plant, structural steel, wood piling, steel sheet piling, hopper bins, steel towers, structural steel superstructure, rein.-con. retaining walls. D. M. Duller, 2nd Natl. Bldg., engr.

CONTRACTS AWARDED

Calif., Oakland—WHARF—El Dorado Terminal Co., 260 California St., San Francisco, 30 x 424 ft. timber wharf, rein.-con. bulkhead, creosoted piling, foot Adeline St., to Duncanson-Harrelson Co., de Young Bldg., San Francisco, $100,000.

AIRPORTS

PROPOSED WORK

Mass., Boston—Commonwealth of Massachusetts, National Guard, soon takes bids 1 and 2 story, 180 x 200 ft., brick hangar, administration building, garage, at airport, Porter St., East Boston. $250,000. C. F. Springall, 50 Park St., Malden, archt. Noted Aug. 20.

Miss., Vicksburg—Municipal Airport Comm., S. Albrecht., chn., preliminary plans hangar, grading administration building, shops, drainage, lighting, runways. $75,000. A. G. Seifried, Baton Rouge, engr.

CONTRACTS AWARDED

Mo., Kansas City—City Council, 1 story, 172 x 490 ft., steel rein.-con., brick hangar, office,

Airports (Continued)

shop, to McCandless Building Co., 400 Victor Bldg., $174,298. Noted Sept. 3.

POWER AND LIGHTING

PROPOSED WORK

Calif., San Francisco—City Council ornamental street lighting with underground systems in Alemany and Sunset Blvds., $39,000. M. M. O'Shaughnessy, city engr.

CONTRACTS AWARDED

Ariz., Winslow—Amer. Gas Security Co., Los Angeles, Calif., gas distributing system, to Lindgren & Swinerton, Inc., 523 West 6th St., Los Angeles, Calif., $60,000.

Tex., San Antonio—See "Bridges."

PARKS AND SPORTS

PROPOSED WORK

Calif., San Diego—See "Schools."

Me., Wilton—Town, E. H. Morrison, Wilton Trust Co., regulation golf course, club house, Stiles & Van Kleek, 97A Newbury St., Boston, Mass., engrs.

N. J., Neptune — W. Reade, sports arena, Main St. $75,000. **Maturity probably soon.**

N. Y., New York—University Club, 13 West 54th St., general contract altering roof for squash courts, driving school, sports gallery, 1 West 54th St. $30,000-$40,000. **Maturity late in fall or winter.** McKim, Mead & White, 101 Park Ave., New York, archts. Noted July 23.

BIDS ASKED

N. Y., Long Island City—Sept. 15, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, erecting, completing field house in Anawanda Park.

CONTRACTS AWARDED

Mass., Boston—Park Dpt., 33 Beacon St., concrete bleachers, grading, Healy Playground, Roslindale, to Guarantee Constr. Co., 16 Harvard Sq., Allston. Est. $25,000. Noted June 18.

N. Y., Lake Placid—City, indoor ice rink, arenas for indoor winter Olympic games, to Arch Roof Constr. Co., 104 West 42nd St., New York; 300 tons structural steel, to American Bridge Co., 71 Bway., New York. Noted Aug. 12.

O., Cleveland—Bd. Educ., F. G. Hogen, dir., building, incl. granite walls, curbing, concrete walks, to Hunkin-Conkey Constr. Co., Newman-Stern Bldg., $91,838. Noted Aug. 13.

HEATING AND VENTILATING

CONTRACTS AWARDED

Minn., Rochester—City, heating pipe line, to Rochester Plumbing & Heating Co., Rochester, $35,427.

N. J., Irvington — Bd. Educ., 1253 Clinton Ave., heating and ventilating system in new school, Grove St., to J. H. Nelles Co., 835 Springfield Ave., $29,276. Noted Aug. 3.

UNCLASSIFIED

PROPOSED WORK

Md., Crisfield—DEPOT, BAGGAGE ROOMS, etc.,—Pennsylvania R.R., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., soon lets general contract remodeling depot, pier incl. suite offices, waiting rooms, platforms, recently destroyed by fire.

N. J., Highlands—IMPROVING SCHOOL GROUNDS—Bd. Educ., J. P. Adair, dist. clk. will not grade, sod, construct concrete sidewalks, and pool on school grounds. $25,000. Project abandoned. Noted Aug. 14.

N. Y., Flushing—COMFORT STATION—Dpt. Parks, W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, 37 x 40 ft. comfort station, Northern Blvd. and Farrington St. $40,000.

Va., Richmond—WAR MEMORIAL—City plans by A. Cram, of Cram & Ferguson, 248 Boylston St., Boston, Mass., Memorial Tower (War Memorial) at Byrd Park. $300,000.

Wis., Baldwin—REPEATER STATION—Amer. Telephone & Telegraph Co., 311 West Washington St., Chicago, Ill., soon takes bids 1½ story, 51 x 55 ft. repeater station. $50,000. Private plans.

Ont., Toronto—SMOKE STACK—Canadian Pacific Ry., H. O. Windsor Sta., Montreal, Que., J. M. R. Fairbairn, ch. engr., large brick or concrete central smokestack. $75,000.

CONTRACTS AWARDED

Mo., St. Louis—CREMATORY, etc.—Bd. P. Serv., 1 story, basement, 20 x 30 ft. crematory, near 5300 Arsenal St., to George Moeller Constr. Co., 3520 Itaska St., $21,653; c.i. pipe, to Amer. Cast Iron Pipe & Fdry. Co., $1,808; rein.-con. base for flood lights, at Lambert-St. Louis Airport, to Dunham Constr. Co., Chemical Bldg., $865. Grand total $24,326. Est. $30,000. Noted Nov. 27.

O., Cleveland—RETAINING WALL—Cuyahoga Co., retaining wall, 2,800 cu.yd. earth excav., 2,100 cu.yd. earth fill, 1,160 cu.yd. mass concrete, 113,400 lb. steel reinforcements, 3,931 ft. 6- to 18-in. vitr. sewer pipe, on north side Cedar Glen Rd., to Speedway Constr. Co., 3441 Lee Rd., $23,206. Est. $37,924.

Pennsylvania and **New York**—GAS PIPE LINE—Lycoming Natural Gas Co., Wellsboro, Pa., A. F. Robinson, engr., 110 mi. 20 in. steel pipe line, pipe to have plain ends with Dresser couplings, from Tioga County, Pa., to Syracuse, N. Y., to Booth & Flynn, 1942 Forbes St., Pittsburgh, Pa. Peoples Natural Gas Co., 545 William Penn Wy., Pittsburgh, Pa., lessor. This corrects report in Sept. 3 issue.

Tex., Port Arthur—OIL TANKS—Texas Co., Port Arthur, and 720 San Jacinto St., Houston, erecting three 118,000 bbl. oil tanks, steel, to Petroleum Iron Wks., Island Park, Beaumont, $175,000.

MATERIALS

PROPOSED WORK

CEMENT—**Los Angeles, Calif.**—Bd. Supervs. Los Angeles Co. soon takes bids 1,575 bbl. cement for gunite facing slab on Rio Hondo, 10,000 bbl. for gunite facing slab on San Gabriel River, 1,850 bbl. for gunite facing slab on Devils Gate Dam.

BIDS ASKED

CAST IRON PIPE, etc.—**Fresno, Calif.**—H. S. Foster, city clk., taking bids c.i. pipe, fittings for Water Dpt. $20,000.

CAST IRON PIPE, etc.—**Helena, Mont.**—City taking bids 12,726 lin.ft. 6- to 16-in. c.i. pipe; takes bids later 11,040 ft. 6- to 12-ft. pipe, 10 tons fittings. $18,000.

ROAD OIL—**Long Island City, N. Y.**—Sept. 14, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 400,000 gal. road oil.

FILLER—**New York, N. Y.**—Sept. 14, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 100 tons pitch joint filler for stone block pavements.

CONTRACTS AWARDED

STRUCTURAL STEEL—**East St. Louis, Ill.**—See "Subways and Tunnels, under Proposed Work."

CAST IRON PIPE, etc.—**Cambridge, Mass.**—City, Water Bd., furnishing c.i. pipe as specified, to Warren Fdry. & Pipe Co., 75 Federal St., Boston, $10,723; gates and valves, to Chapman Valve Mfg. Co., 71 A St., South Boston, various prices; lead, to Leadite Co., 3 Newport St., Arlington, at $176.40 per ton.

ROAD GRAVEL—**Greenville, Miss.**—Bd. Mississippi Levee Comrs., 5,000 tons road gravel, f.o.b. cars Glen Allen, to Brookhaven Gravel Co., Brookhaven, at $1.19 per ton; gravel surfacing 2.96 mi. levee road, near Glen Allen, to Hennington Bros., Crystal Springs, $2,250. Noted July 9.

RAILS, etc.—**Cincinnati, O.**—Cincinnati Union Terminal Co., Temple Bar Bldg., 3,162 gross ton rails to United States Steel Corp., 71 Bway., New York; 1,454 gross ton rails, to Inland Steel Co., 38 South Dearborn St., Chicago, Ill.; 7,800 steel rail joints, to Rail Joint Co., 80 East Jackson Blvd., Chicago, Ill.; 76,000 tie plates to Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.; 2,940 kegs railroad spikes, to Bethlehem Steel Corp., Widener Bldg., Phila., Pa. Total cost $400,000.

EQUIPMENT

BIDS ASKED

MOTOR GENERATING SETS — **San Francisco, Calif.** — Sept. 14, by L. S. Leavy, city purch. agt., 10 electric welded motor generating sets and accessories for School Dpt.

TRUCK—**Wash., D. C.**—Sept. 15, by District Comrs, one 5 ton automobile truck.

PRESSURE TANK—**Norton, Mass.**—D. M. Runge, in market 1,000 gal. pressure tank.

GASOLINE SHOVEL—**Watertown, Mass.**—Watertown Builders Supply Co., in market gasoline shovel, ½ to 1 yd.

TOOLS, etc.—**New York, N. Y.**—Sept. 14, by P. J. Dooling, comr. Purchase, Municipal Bldg., tools, implements and machinery to Dpts. Parks, Queens, Sanitation and Water Supply, Gas & Electricity.

REFRIGERATION EQUIPMENT — **Amherst.** (br. Lorain) **O.**—Sept. 11, by Lorain Co. Memorial Hospital Com., F. L. Ellenberger, clk., Court House, Elyria, refrigeration equipment for new hospital now under construction.

SCALE-PLATFORM — **Shaker Heights** (br. Cleveland), **O.** — Sept. 17, by City, E. P. Rudolph, clk., 15-ton scale-platform, size 9 x 18.

MAINTAINER—**Beaumont, Tex.**—Sept. 14, by Jefferson Co., c/o B. N. Johnson, judge, 1 power maintainer with scarifier.

CONTRACTS AWARDED

BOOSTER PUMP—**Beverly Hills, Calif.**—City Council, booster pump for Water Dpt., to Pacific Pump Wks., Ltd., Los Angeles, $1,833. Noted July 9 under "Waterworks."

PUMP—**Sioux City, Ia.**—Waterworks Dpt., P. Sarin, supt., pump, to Interstate Mchy. & Supply Co., 1006 Douglas Ave., Omaha, Neb., $9,000.

POWER RECTIFIER EQUIPMENT—**Phila., Pa.**—City Transit, City Hall Annex, A. Mardock, dir., Contr. 219, 2 units mercury-arc power rectifier equipment for Sub. Station 6, Broad Street Subway, to Allis-Chalmers Mfg. Co., West Allis, Wis., $123,500.

FOREIGN

China, Shanghai—Texaco Oil Co., Shanghai and Texas Petroleum Co., 135 East 42nd St., New York, will build plant additions to replace warehouse and distribution facilities, recently destroyed by flood and fire, by separate contracts and day labor. $250,000. **Maturity indefinite.**

Union Socialist Soviet Republics—Soviet Government, c/o Amtorg Trading Co., 261 5th Ave., New York, plans 1,750 mi. pipe line from Armavir in North Caucasus to Lisky, with later extension to Moscow; also plans plants for manufacturing lubricating oils and asphalt at Moscow, Samara, and Stalingrad. **Maturity during 1932 and later.**

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Calif., Los Angeles — A. Ahern, c/o L. A. Bryant, archt., 6513 Hollywood Blvd., taking bids general contract 9 story, basement, rein.-con., plaster front with art stone trimming, Stanley Ave. and Hollywood Blvd. $250,000.

Calif., Los Angeles—L. A. Bryant, archt., 6513 Hollywood Blvd., taking bids 9 story, basement, rein.-con., Stanley Ave., for M. O'Hern, c/o architect. $250,000.

N. J., Asbury Park — See "Contracts Awarded."

N. J., Lakewood—Lakewood Milk & Rest Cure, Inc., 9 Park Pl., New York, bids about Jan. 15, general and separate contracts, 2 story, basement, brick, steel hotel, sanitarium, $300,000. H. Ginsberg, 205 East 42nd St., New York, archt.

N. J., South Orange—Harris & Sohn, archts., 17 Mechanic St., Newark, taking bids on revised plans, general contract, 2 and 3 story, basement, 50 x 250 ft., Irvington Ave., Kilburn Pl. and Normandy Court, for Morris Mandelbaum Assoc., 7 East 42nd St., New York. Est. $300,000. Former bids rejected. Noted Mar. 19.

N. Y., Astoria—See "Contracts Awarded."

N. Y., Auburndale—See "Contracts Awarded."

N. Y., Forest Hills—See "Contracts Awarded."

N. Y., Harcourt Park—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Rockaway—See "Contracts Awarded."

Pa., Jerkintown — Sept. 12, by Owner, c/o C. H. Fries, archt., Frankford and Oxford Sts., Phila., 6 story, basement, 35 x 110 ft., rein.-con., brick, steel, plain found. $150,000.

CONTRACTS AWARDED

Mass., Reading—Sanborn Constr. Co., Inc., 31 Central Ave., Lynn, 4 story, basement, brick, steel, plain found., Sanborn St., separate contracts. $160,000. D. J. Green, 20 Burrill Ave., Lynn, archt.

N. J., Asbury Park—Warner & Warner, c/o P. Freshman, archt., 50 Court St., New York, 6 story, basement, 100 x 150 ft., brick, steel, Bergh and 1st Sts., separate contracts. $500,000.

N. Y., Astoria—Academy Developers, Chatham Phoenix Bldg., Long Island City, 86 x 100 ft. apartment, 32nd St., and Bway., separate contracts. $200,000. B. Braunstein, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Auburndale—Auburndale Apartments, Inc., 110-18 Jamaica Ave., apartments, 188th St. and 48th Ave., separate contracts. $180,000. A. Allen, 163-18 Jamaica Ave., archt.

N. Y., Forest Hills—Vinkow Building Corp., 1317 Park Pl., Brooklyn, 6 story, 82 x 119 ft., 113th St. and 91st Ave., separate contracts. $200,000. Cohn Bros., 350 Stone St., Brooklyn, archt.

N. Y., Harcourt Park—Alden Terrace Homes, 8917 161st St., Jamaica, and 6492 84th Pl., Glendale, apartment, 64th and Dry Harbor Rd., separate contracts. $150,000. C. Infanger, 2634 Atlantic Ave., Brooklyn, archt.

N. Y., Long Island City—Sfard Realty Corp., 26 Court St., Brooklyn, 4 story, 77 x 180 ft., Sedgwich and Catalpa Aves., separate contracts. $225,000. Charin & Ungarleider, 26 Court St., Brooklyn, archts.

Constr. News page 103

Residential (Continued)

N. Y., New York—Altoz Realty Corp., c/o A. Tozzini, 1160 East Tremont Ave., 6 story, basement, 104 x 125 ft., East Tremont Ave., separate contracts and day labor. $200,000. M. W. Del Gaudio, 545 5th Ave., archt.

N. Y., New York—J. L. Redmond, 707 Park Ave., 6 story, 117 East 70th St., to Hegeman Harris, 360 Madison Ave. Est. $170,000.

N. Y., Rockaway—Skaler Realty Corp., 45 West 167th St., New York, apartment, Rockaway Blvd. and Beach 117th St., separate contracts. $200,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., New York, archts.

CLUBS

PROPOSED WORK

Conn., New Haven—Y.M.C.A., 347 Madison Ave., New York, plans by D. Orr, 185 Chapel St., Y.M.C.A. building. $600,000.

Mass., Everett—Parlin Associates, F. E. Jennings, 45 Milk St., Boston, c/o Parker, Thomas & Rice, archts., 177 State St., Boston, soon lets contract 2 story, basement, brick, stone, steel dormitory addition to Y.M.C.A., plain found., Webster and Church Sts., $150,000. Noted Aug. 20.

Mass., Falmouth—Marine Lodge of Free & Accepted Masons, W. Chambers, Woods Hole, raising $150,000 funds, 2 story, basement, brick temple, stores. Architect not appointed.

N. J., Weehawken—Weehawken Lodge 1456 B.P.O.E., H. Bischoff, pres., Bldg. Commission, 26th St., will not build 2 story, basement, brick, steel club house addition, Boulevard E and 6th St. $150,000. W. Mahnken, 26 Journal Sq., Jersey City, archt. F. Ricker, 685 Hudson Ave., West New York, assoc. archt. Noted Aug. 12.

BIDS ASKED

N. J., Freehold—E. H. Schneider, archt., 3rd Ave., Spring Lake, bids about Nov. 1, general contract 2 story, basement, brick, steel club house, for Knights of Columbus. $200,000. Noted Dec. 11.

HOSPITALS

PROPOSED WORK

Me., Bar Harbor—Bar Harbor Hospital, H. C. Copp, pres. Bd. Trustees, hospital. $150,000 or more. Architect not appointed.

Mass., Boston—City, Hospital Dpt., plans by J. H. Ritchie & Associates and soon takes bids remodeling 3 story, basement, brick hospital ward building, L. G. Burnham Memorial Building, Harrison Ave. $150,000.

Mo., St. Louis—Bethesda Hospital, J. Herndon Smith, pres. Bd. Trustees, 3649 Vista Ave., plans by Smith & Ganger, 514 Louderman Bldg., St. Louis and Pond, Pond, Martin & Lloyd, assoc. archts., 180 North Michigan Ave., Chicago, Ill., 8 story, basement, brick, rein.-con., stone main building, 4 story nurses' home, boiler house, for hospital group, North, South and Eager Rds. $1,500,000. Noted Feb. 5.

N. Y., New York—Presbyterian Hospital, 620 West 168th St., plans by James Gamble Rogers, 156 East 46th St., eye institute, Fort Washington Ave. and Bway. $1,100,000.

O., Cleveland—Jewish Consumptive Home Assn., c/o B. Horwitz, 11115 Willomere Ave., 2 story, basement, brick, steel, concrete sanitorium, Russell Rd. $200,000. Architect not appointed.

O., Lakewood—City, E. A. Wiegand, mayor, sketches by Hadlow, Hughes, Hick & Conrad, archts. and engrs., Citizens Bldg., Cleveland, 8 story, basement, brick, steel, concrete hospital, Bunts Rd. and Franklin Blvd. $1,000,000. Noted Jan. 1.

Pa., Pittsburgh—South Side Hospital, J. E. Roth, pres., 6400 Beacon St., plans by P. C. Dowler, Century Bldg., and takes bids early in fall, brick, steel, South 20th and Jane Sts. $1,500,000.

Vt., Waterbury—Vermont Hospital for Insane, E. A. Stanley, supt., plans by F. L. Austin, 240 College St., Burlington, brick men's ward, Main St. $150,000. Project in abeyance until 1932. Noted Aug. 6.

BIDS ASKED

Calif., San Francisco—Sept. 16, by S. J. Hester, secy. Bd. P. Wks., City Hall, general contract Health Center Building, 4 story, rein.-con., Civic Center, for City and San Francisco Co. $325,000. Noted Aug. 21.

Conn., Willimantic—Sept. 15 (extended date), by St. Joseph's Hospital, 88 Jackson St., altering, 3 story, basement hospital, nurses home, Crow, Lewis & Wick, 200 5th Ave., New York, archts. Noted Sept. 3.

N. J., Bordentown—Dpt. Institutions & Agencies, State Office Bldg., Trenton, taking bids 2 story, basement, 268 x 352 ft., and 2 story, basement, 35 x 185 ft. industrial building, New Jersey State Prison Farm. $250,000. Div. Architecture & Constr., State Office Bldg., Trenton, archt.

N. J., Glen Gardner — Dpt. Institutions & Agencies, State Office Bldg., Trenton, taking bids 2 story, basement, brick, steel rein.-con. school, plain found., at Tubercular Diseases

Constr. News page 104

Sanatorium. $150,000. Div. Architecture & Constr., State Office Bldg., Trenton, archt. Noted June 18.

N. J., Scotch Plains—Bd. Freeholders Union Co., Court House, Elizabeth, bids about Nov. 1, 2 story, basement, brick, steel sanitorium, Bonnie Burnham Sanitarium, Oakley & Son, 1259 Clinton Pl., Elizabeth, archts. Noted Sept. 3.

N. Y., Long Island City—Sept. 14, by J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., New York, general contract, refrigerators, plumbing, drainage, water supply Building D, Queens General Hospital, 164th St. between Grand Central Parkway and Goethals Ave.

N. Y., Staten Island—Sept. 14, by J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., New York, erecting, completing Male Pavilions A, B, C and D, New York City Farm Colony. Former bids rejected. Noted Aug. 20.

CONTRACTS AWARDED

Minn., Fergus Falls—State Comm. of Administration & Finance, 10 State Capitol Bldg., St. Paul, general contract, 3 story, basement, brick, stone, rein.-con. hospital, State Hospital for Insane, to J. Lauritzen Co., Fergus Falls, $97,000. Noted Aug. 6.

CHURCHES

PROPOSED WORK

Conn., Bridgeport—Greek Orthodox Church, J. E. Xanthopoulos, pastor, 1335 Park Ave., 1 story, basement church, Myrtle Ave. $150,000. Architect not appointed.

Mass., Lowell—St. Michael's Roman Catholic Parish, J. J. Shaw, pastor, 6th St., and J. C. Flaherty, archt., Green Harbor, Mansfield, soon lets contract, revised plans 3 story basement brick convent, plain found., 6th St. $150,000 or more. Former bids rejected. Noted Aug. 13.

Mass., Rehoboth—Rehoboth Cong. Church, W. A. Redfield, pastor, parish and community house. $150,000 or more. Architect not appointed.

N. J., Carteret—St. Joseph's Roman Catholic Church, C. McCarthy, pastor, will not build 2 story, basement church, rectory, lyceum. $200,000. Project abandoned. Noted Jan. 8.

N. J., Garfield—Owner, c/o J. H. Dynes archt., 15 Orient Way, Rutherford, sketches 1 story, basement, brick, steel Sunday school, fellowship hall. $150,000.

N. J., Glen Ridge—Glen Ridge Congregational Church, Ridgewood Ave., 2 story, basement, brick, steel church and Sunday school. $250,000. **Maturity probably in November.** Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted July 16.

N. J., Passaic—St. Peter and Pauls Polish Natl. Church, J. Wroblenski, pastor, 126 River Dr., 2 story, basement, 50 x 100 ft., brick, steel, Armory Park. $510,000. J. T. Camlet, 26 Piaget Ave., Clifton, archt. Bids in. Project in abeyance. Noted Aug. 6.

N. J., Red Bank—First Methodist Church, F. A. DeMaris, pastor, Red Bank, revised plans by N. Hulme, 1523 Chestnut St., Phila., Pa., and H. E. Tralle, consult. archt., Pinehurst Ave. and 183rd St., New York, 3 story, basement, brick, steel, Broad St. $200,000. Noted Mar. 19.

N. J., West Orange—Roman Catholic Diocese, 22 Mulberry St., Newark, 2 story, basement, brick, steel church, St. Cloud Sect. $150,000. Maturity probably soon. Architect not appointed.

N. Y., New York—Church of St. Roch, Wales Ave. near 149th St., soon lets general contract church, rectory, Wales Ave. and 149th St. $150,000. DePace & Juster, 151 West 46th St., archts. Noted Aug. 19.

N. Y., New York—John Street Church, 44 John St., plans by A. G. Smith, c/o owner, 19 story church, office. To exceed $2,000,000.

O., Cleveland Heights—First Church of Christ Scientist of Cleveland Heights, c/o W. H. Jackson, chn. Bd. Trustees, Leader Bldg., Cleveland, plans by R. M. Johnson, Guardian Bldg., Cleveland, brick, steel, concrete, Fairmount Blvd. and Lee Rd. $250,000.

Wis., Marinette — First Trinity Lutheran Church, H. C. Westphal, pastor, 1509 Thomas St., plans by C. John, 929 North Jackson St., Milwaukee, 2 story, basement, 85 x 140 ft., brick, rein.-con., stone, church, social hall, organ. $150,000.

BIDS ASKED

Calif., San Diego—F. L. Hope, archt., Bank of America Bldg., taking bids part 2 and 3 story, 150 x 225 ft., rein.-con. monastary, Hawley Blvd., for Carmelite Sisters, c/o architect. $200,000.

Calif., Westwood—Roman Catholic Archbishop of Los Angeles and San Diego, taking bids general contract church auditorium, Selby and Ohio Aves. Newton & Murray, 502 Architects Bldg., Los Angeles, archts. Noted Dec. 4.

N. J., Morristown—St. Margaret's Roman Catholic Church c/o Fanning & Shaw, archts., 49 Ward St., Paterson, bids about Sept. 22, general contract 2 story, basement, brick, steel church, school, Columbia St. and Sussex Ave. $150,000. Noted Sept. 3.

CONTRACTS AWARDED

Calif., Burlingame—E. Eames, archt., 35 Sacramento St., San Francisco, general contract, 4 story, basement, rein.-con. home novitiate, to Barrett & Hilp, 918 Harrison St., San Francisco, for Roman Catholic Archbishop, 1100 Franklin St., $160,000. Noted Sept. 3.

SCHOOLS

PROPOSED WORK

Calif., San Diego—San Diego Teachers College soon takes bids physical educational building, $177,000, science hall, $16,800, store room, $1,200, improving grounds $10,000; swimming pool $20,000, road improvement $32,000. W. H. Wheeler, California Bank Bldg., archt.

Conn., Bridgeport—City, W. Warren, supt. schools, plans by J. W. Northrup, 211 State St., 2 story, basement, brick school, Northeast Sect. $150,000.

Ind., Anderson—Bd. Educ., J. T. Day, pres., rebuilding 2 story rein.-con., brick school, recently destroyed by fire, 24th and Columbus Aves. $160,000.

Ind., East Chicago—School Comrs. plans by K. Norris, East Chicago, Washington School, 3 story, basement, 80 x 220 ft., rein.-con. brick, stone, hollow tile, 1610 East 140th St. $350,000.

Ind., Michigan City—St. Marys Parish plans by H. J. Gaul, 228 East Superior St., Chicago, Ill., 2 story, basement, brick, steel school, West 10th St. $150,000.

Ind., South Bend—Notre Dame University, c/o building com., sketches by M. E. Carroll & C. E. Dean, 713 Linwood Blvd., Kansas City, Mo., Knute Rockne Memorial Field House, rein.-con., brick, stone. $1,000,000. Noted July 30.

Mass., Boston—City of Boston, Dpt. School Buildings, plans by W. W. Drummey, 80 Boylston St., and soon takes bids 2 story, basement, brick, stone, plain found., Popular and Dale Sts., Roslindale. To exceed $150,000.

Mass., Boston—City, Dpt. School Buildings, sketches by McLaughlin & Burr, 88 Tremont St., 2 story, basement, brick, steel addition to Boys Latin School, Fenway Sect. To exceed $150,000. Noted Aug. 20.

Mass., Lawrence—City, M. A. Landers, mayor, 2 story, basement, brick school. $150,000 or more. Architect not appointed.

Mass., New Bedford—Swain Free School, 391 County St., plans by N. C. Smith, 10 North 7th St., altering and constructing 2 story, basement, brick, school addition, County St. $150,000.

Mass., Northboro—Town, J. W. Allen, chn., building com., altering and constructing high school addition. $150,000 or more. Architect not appointed.

Mass., West Roxbury—City of Boston, Dpt. School Buildings, sketches by H. R. Duffie, 364 Belgrade Ave., 2 story, basement school, plain found., Beech St. $150,000.

Mass., Worcester—Clark University, 340 Main St., sketches by E. Kebbon, 522 5th Ave., New York, 2 story, brick, stone, steel gymnasium, auditorium, Main St. $150,000.

Mich., Detroit—Detroit College of Law, c/o Geo. D. Mason Co., archts., 409 Griswold St., 4 story, basement, 80 x 90 ft., brick, steel, rein.-con. college, incl. study rooms, offices, locker room, plain found., Elizabeth St. $150,000.

N. J., Cliffside Park—Bd. Educ., Palisade Ave., sketches by R. J. Cadien, 545 Gorge Rd., Grantwood, 2 story, basement, brick, steel high school addition, Palisade Ave. $325,000. Soon vote bond issue for same.

N. J., Cliffside Park—Bd. Educ., Palisade Ave., revised sketches by R. J. Cadien, 545 Gorge Rd., Grantwood, 2 story, basement, brick, steel addition to School 3. $225,000. Taxpayers will soon vote bond issue for same. Noted July 23.

N. J., Englewood—Bd. Educ., 11 Engle St., will not build 2 story, basement, brick, steel vocational school. $150,000. Project abandoned. Architect not appointed. Noted July 30.

N. J., Franklin Park—Bd. Educ., Franklin Park, plans by H. G. Bach, 63 Schureman St., New Brunswick, 2 story, basement, brick, steel addition. $150,000.

N. J., Jersey City—Bd. Educ., H. F. O'Mealia, pres., Administration Bldg., 4 story, basement, brick, steel, rein.-con. high and grade school, Hudson Blvd., Boardwalk Parkway and Grant Ave. $2,000,000. J. T. Rowland, Jr., 30 Journal Sq., archt. **Maturity probably in November.** Noted Aug. 6.

N. J., Livingston—Bd. Educ., will not build 2 story, basement addition to Roosevelt School. $200,000. Project abandoned. Noted Aug. 20.

N. J., New Lisbon—Dpt. Institutions & Agencies, State Office Bldg., Trenton, will not build 2 story, basement, brick, steel school, at State Colony for Feebled Minded Males. Project abandoned. Noted June 16 Daily.

N. Y., Dover—St. Mary's Roman Catholic Church, R. A. Mahoney, pastor, West Blackwell St., Wharton, will not alter and construct church, school addition. $150,000. Project abandoned. Fanning & Shaw, 49 Ward St., Paterson, archts. Noted Aug. 6.

Schools (Continued)

O., Wickliffe—Bd. Educ. plans by Fulton & Taylor, 8120 Euclid Ave., Cleveland, 2 story, brick, steel concrete school. $150,000 bond election Nov. 3 for same.

Pa., Meadville—Allegheny College, W. P. Tolley, pres., 520 Main St., sketches womens dormitory, on campus. Architect not appointed.

R. I., Warwick—Town, W. E. Sherman, supt. schools, sketches by W. R. Walker & Sons, 49 Weybosset St., Providence, Junior High School, 2 story, basement, brick. $200,000. Noted Feb. 5.

Tenn., Knoxville—University of Tennessee, S. Johnson, secy., c/o J. J. Walker, South College, rejected bids Aug. 26, educational building, Will readvertise. $300,000. Barber McMurray, General Bldg., archts. Noted Aug. 20.

Ont., St. Catharines—Bd. Educ., C. T. McBride, secy., sketches by S. B. Coon & Son, 4 St. Thomas St., Toronto, 3 story, 40 x 120 ft. vocational school addition and installing new equipment. $180,000.

BIDS ASKED

Calif., Eldridge—Sept. 22, by State Div. Architecture, Sacramento, 1 story, rein.-con. school addition, ward building. $150,000.

Calif., Pasadena—California Institute of Technology bids about Oct. 1, 3 story, 2 basement, chemistry building, 3 story, basement biology building, both rein.-con., stone, steel sash, ornamental iron, East California St. $400,000. Mayers, Murray, Phillips & Goodhue, 2 West 47th St., New York, archts. Noted Sept. 3.

Minn., Minneapolis—Sept. 18, by Bd. Educ., G. F. Womrath, bus. supt., 305 City Hall, 4 story, basement, 150 x 300 ft., rein.-con., brick, stone, 3rd Ave. S. and 11th St. $700,000.

N. J., Caldwell—Bd. Educ., High School, bids about Oct. 15, 2 story, basement, brick, steel, rein.-con., Central Ave. $150,000. C. W. Wands, 309 Bloomfield Ave., archt. Noted Aug. 6.

N. J., Clifton—Bd. Educ., High School, bids about Oct. 15, 2 story, basement, brick, steel school addition, Gregory Ave. $150,000. Lee & Hewitt, 152 Market St., Paterson, archts. Noted July 9.

N. J., East Orange—Bd. Educ., 19 Winans St., bids about Oct. 1, general contract Junior High School, 2 story, basement, brick, steel, rein.-con., North Clinton St. and Renshaw Ave. $350,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Sept. 3.

N. J., Englewood—L. C. Licht, archt., 4 Dean St., bids about Oct. 1, general contract 2 story, basement, brick, steel school, for Englewood School for Boys, 35 Dwight Pl. $200,000. Noted Aug. 20.

N. J., Hackensack—Bd. Educ., 355 State St., bids about Nov. 1, 2 story, basement, brick, steel, Union St. $210,000. A. Dore, 15 Main St., Hackensack, archt. Noted Aug. 14.

N. J., Hackensack—Bd. Educ., 355 State St., bids about Nov. 1, 2 story, basement, brick, steel, Union St. $210,000. A. Dore 15 15 Main St., archt. Noted July 16.

N. J., Kearny (sta. Arlington)—Bd. Educ., E. Stevenson, secy., Garfield School, taking bids 2 and 3 story, basement, 65 x 210 ft., brick, rein.-con., steel, plain found., Kearny and Stewart Aves. $200,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts.

N. J., Morristown—Bd. Educ., O. M. Gable, dist. clk., 50 Early St., bids about Sept. 15, 2 story, basement, brick, steel, rein.-con., Mills St. $200,000. C. C. Voorhees, 1 Schuyler Pl., Morristown, archt. Noted Sept. 3.

N. J., Paterson—Bd. Educ., City Hall, bids about Oct. 1, 2 story, basement, brick, steel, rein.-con., school, Totawa Ave. $150,000. Lee & Hewitt, 152 Market St., Paterson, archts. Noted June 25.

N. J., Paterson—Bd. Educ., City Hall, bids about Oct. 1, School 18, 2 story, basement, brick, steel, Riverside Sect. $250,000. Fanning & Shaw, 49 Ward St., archts. Noted June 11.

N. J., Sussex—Bd. Educ., J. W. Wilson, clk., bids about Sept. 15, 2 story, basement, brick, steel high school, plain found. $150,000. Jacoby & Everett, Commonwealth Bldg., Allentown, Pa., archts.

N. J., Teaneck—Bd. Educ., High School, bids about Oct. 15, 3 story, basement, 100 x 220 ft., brick, steel, rein.-con high school addition, Queen Anne Rd. $635,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted June 18.

N. J., West New York—Bd. Educ., Municipal Bldg., bids about Oct. 15, altering and 2 story, basement, brick, steel addition to School 3, 11th and Polk Sts. $200,000. F. J. Ricker, 185 Hudson Ave., archt. Noted Sept. 3.

N. Y., Ithaca—Sept. 24, by Commissioner Educ., Education Bldg., Albany, constructing Agricultural Economics Building, New York State College of Agriculture, Cornell University; adv. E. N.-R. Sept. 10.

R. I., North Kingston—Sept. 19, by Town, Superintendent Schools, Town Hall, 3 story, basement, brick, steel, concrete Senior High School. $250,000. Wm. Walker & Son, 49 Weybosset St., Providence, archts. Noted Aug. 20.

Ont., Toronto—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., San Francisco—Roman Catholic Archbishop, 4 story, rein.-con. girls home, Silver Ave. to J. A. Bryant, Call Bldg., $200,000. Noted Sept. 3.

Conn., Hamden—Town, c/o Towner & Sellew, archts., 329 Main St., Middletown, 2 story, basement, brick, stone school and community building, plain found., to Manchester Constr. Co., Inc., 875 Main St., Manchester. Est. $150,000.

Mass., Cambridge—Radcliff College, 10 Garden St., 3 story, basement, brick, limestone, steel, laboratory (chemistry and physics department), plain found., 500,000 cu.ft. floor space, near College Grounds, to M. C. Tuttle Co., Park Sq. Bldg., Boston. Est. exceeds $150,000.

Mass., Jamaica Plain—City of Boston, Dpt. School Buildings, altering and constructing 2 story, basement, brick, steel school addition, plain found., to J. B. Dolan, 43 Tremont St., Boston. Est. $160,000. Noted Aug. 6.

Mass., Somerville—City, School Bd., 2 story, basement, brick, stone school, plain found., to Wm. T. Powers Co., 24 Union Sq., $97,150. Noted Aug. 6.

Mass., Springfield—School Dpt., 2 story, basement, 60 x 170 ft., brick school, plain found., to E. J. Pinney Co., 220 Dwight St., $97,730; heating and ventilating, to Geo. H. McClean Co., Inc., 77 Dwight St., $15,783; plumbing, to A. E. Mayer, 419 Main St., $7,448; electrical work, to M. L. Schmitt, 198 Chestnut St., $5,100. Grand total $126,061. Noted July 2.

Mass., Worcester—H. M. Warner, 321 West 44th St., New York, 2 story, 60 x 115 ft., brick, stone memorial auditorium, to Fred T. Ley Co., Inc., 1215 Main St. Est. $250,000. Noted Aug. 13.

N. J., Englewood—Bd. Educ., 11 Engle St., general contract 2 story, basement, brick, steel high school, to W. Kidde & Co., 140 Cedar St., New York, $413,910; plumbing, heating and ventilating, to John Boyd Plumbing & Heating Co., 310 Elm Pl., Leonia, $88,588; electrical work, to A. Hasbrouck, Jr., Inc., 240 Main St., Hackensack, $32,989; steel and ornamental iron, to Breen Iron Wks., 272 Badger Ave., Newark, $39,600. Grand total $575,087. Noted July 30.

Pa., Munhall—Bd. Educ., L. J. Holman, pres., general contract Elementary and Junior High School, 1 and 3 story, basement, 143 x 271 ft., brick, limestone, rein.-con., to Hodder Constr. Co., 817 Talbot Ave., Braddock, $208,785; heating to McGinness, Smith & McGinnes, 527 1st Ave., Pittsburgh; plumbing to Iron City Plumbing Co., 527 1st Ave., Pittsburgh; wiring, to Rodden Electric Co., North Homewood Ave., Pittsburgh. Total est. $300,000-$400,000. Noted Aug. 20.

Ont., Toronto—East York Twp., School Sect. 27, W. M. Burgess, secy., 30 Logan Ave., general contract 2 story, basement, 16 room, brick, concrete, steel, stone school to Holtby Bros., rear 61 Hepbourne St., steel, to Desher Steel Constr. Co., 80 Commissioners St.; excavation, by day labor. Est. $200,000. Noted Aug. 6.

THEATRES

PROPOSED WORK

Ind., Evansville—Dixie Realty Corp., A. O. Hassensall, pres., Claremont Hotel Bldg., 127 Locust St., plans by A. S. Graven, Inc., 100 North La Salle St., Chicago, Ill., altering, remodeling theatre, incl. new equipment, plastering, plumbing, skylight, steel sash, fire doors, 2nd and Sycamore Sts. $200,000.

Mass., Amherst—Bd. Trustees, Amherst College, plans by McKim, Mead & White, 101 Park Ave., New York, 1 story, 115 x 130 ft., brick, steel, stone theatre. $150,000. **Maturity 1932.** Noted May 14.

N. J., Trenton—T. W. Lamb, archt., 701 7th Ave., New York, soon lets general contract 1 story, basement, 80 x 160 ft., brick, steel, theatre, 18 South Broad St., for Trenton Theatre & Building Co., F. V. Storrs, 701 7th Ave., New York. Est. $150,000. R.K.O. Proctor Corp., 1564 Bway., New York, lessee. Noted Aug. 20.

BANKS

PROPOSED WORK

N. J., Asbury Park—Asbury Park & Ocean Grove Bank, 308 Main St., will not build 8 story, basement, brick, steel bank, office, Main St. and Mathson Ave. $350,000. E. A. Arend, Kinsmouth Bldg., archt. Project abandoned. Noted July 16.

CONTRACTS AWARDED

Conn., New Haven—Connecticut Savings Bank, 47 Church St., altering and constructing bank addition, to Hegeman—Harris Co., 360 Madison Ave., New York. Contractor now taking bids for materials and separate contracts. Noted Aug. 20.

N. Y., New York—Manufacturers Trust Co., 55 Broad St., altering and constructing bank, office addition, to J. C. O'Brien Bridge Plaza, Long Island City. Est. $300,000. Noted Aug. 12.

OFFICES

PROPOSED WORK

Mass., Melrose—See "Stores."

Mich., Detroit—Detroit Edison Co., 2000 2nd Blvd., 18 story, basement, brick, steel, stone rein.-con. office, caisson found., 1st St. $2,000,000. Private plans.

N. J., Jersey City—Owner, c/o D. J. Screen, archt., 60 Park Pl., Newark, 13 story, basement, 100 x 150 ft., brick, steel rein.-con., office, stores, Summit Ave. $650,000.

CONTRACTS AWARDED

Mass., Boston—Johnson Securities Co., Park Sq. Bldg., 2 story, basement 85 x 140 ft. rein.-con., New England distributing office building and garage, concrete pile found., 787 Commonwealth Ave., to Chase & Gilbert, Park Sq. Bldg. Est. $150,000.

N. J., Paterson—J. Holt, archt., 134 Market St., general contract 2 story, basement, 25 x 100 ft., brick, steel office, stores, for T. S. Barker 175 Market St., carpentry, to L. Gottlieb, 491 East 27th St., Paterson; plumbing and heating, to F. A. McBride Co., 327 Grand Ave., Paterson; electrical work, to J. W. Broadfoot Co., 306 East 21st St. Est. $150,000. Noted Aug. 20.

STORES

PROPOSED WORK

Calif., Los Angeles—W. H. Leimert Co., 4322 Crenshaw Blvd., plans by G. J. Adams, 5514 Wilshire Blvd., 3 story, 60 x 140 ft., rein.-con department store, Degan Blvd. and Leimert Pl. in Leimert Park. $150,000.

Mass., Boston—H. F. Winslow, 30 State St., plans by H. B. Alden, 126 State St., store and office building, 131 Newbury St. $150,000 or more.

Mass., Boston—See "Stores."

Mass., Melrose—M. Reaser, 33 Tremont St., Boston, 3 story, basement, brick stores, office 517 Main St. $150,000. Architect not appointed.

N. J., Asbury Park—Owner, c/o C. B. Cook, archt., 505 Bond St., 2 story, basement, brick, steel store, office. $150,000.

N. J., East Orange—I. Bachman, c/o Stegler & Greenberg, archts., 164 Market St., 2 story, basement, brick, steel store, office apartment, Dodd and Prospect Sts. $150,000. Former plans abandoned. Noted July 2.

N. J., Morristown—Stanuelm Realty Co., c/o W. E. Lehman, archt., 972 Broad St., Newark, 2 story, basement, 70 x 135 ft., brick, steel professional and store, South and Pine Sts. $150,000. Project in abeyance. Noted Aug. 6.

N. J., North Bergen—Owner, c/o F. Huberti, archt., 116 Hauxhurst Ave., Weehawken, 2 story, basement, brick, steel store, dance hall, 879-81 Bergenline Ave. $150,000.

N. J., Paterson—Inland Market Corp., A. Alfano, in charge, Bank St., will not build 2 story, basement, 30 x 125 ft., brick, steel store, office, storage and comfort station, Island Market Sect. $150,000. Project abandoned. Noted July 16.

BIDS ASKED

N. J., Westfield—R. R. Chatfield, Inc., archt., 225 East Broad St., taking bids separate contracts 3 story, basement, brick, steel store, apartment, for C. C. Gordon, 437 North Ave. $150,000.

PUBLIC

PROPOSED WORK

Mass., Swampscott — POLICE STATION — Town, Planning Bd., G. Glidden, police station, Burrill St. $150,000. Architect not appointed.

Mich., Alma—ARMORY—State Administrative Bd., Lansing, plans by Frantz & Spence, Saginaw, 1 and 2 story, brick, steel, rein.-con., plain found. $150,000.

N. J., Bernardsville — LIBRARY — Bd. Trustees sketches 1 story, basement, brick, steel library. $150,000.

N. J., Caldwell—LIBRARY, etc.—Bd. Boro Council, Boro Hall, will not build 2 story, basement, brick, steel library, civic center, Roseland and Westfield Aves. $150,000. Project abandoned. Noted June 18.

N. J., Hackensack—CITY HALL—Hackensack Impvt. Comn., City Hall, 2 story, basement, brick, steel, rein.-con., 1st St. $150,000. **Maturity in Spring 1932.** Architect not appointed. Noted July 30.

N. Y., New York — MUSEUM — Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, art museum, for Metropolitan Museum of Art, 5th Ave. from 80th to 84th Sts. $3,350,000. **Maturity of bids late in November.** J. R. Pope, 542 5th Ave., archt. E. E. Seeley, 101 Park Ave., engr. Noted July 2.

Constr. News page 105

Public (Continued)

Okla., Pawnee—COURT HOUSE—Bd. Comrs. Pawnee Co. sketches new court house. $150,000.

Tenn., Memphis—ALMS HOUSE—Shelby Co. Hospital, G. B. Stewart, supt., and E. W. Hale, chn. Shelby County Bd. Comrs., sketches brick, concrete, Raleigh Rd. $400,000.

BIDS ASKED

Mass., Revere—POLICE STATION—Sept. 17, by Metropolitan Dist. Comn., 20 Somerset St., Boston, altering and constructing 2 story, basement, brick addition, Revere Beach Parkway, $150,000. E. H. Rogers, Dir. Park Engr., 20 Somerset St., Boston.

N. J., Maplewood—MUNICIPAL—Township Com., Municipal Bldg., bids about Sept. 15, 2 story, basement, brick, steel, Valley St. $200,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Aug. 27.

R. I., East Providence (br. Providence)—MARKET—Providence Public Market, O. Swanson, 380 Westminster St., taking bids 2 story, basement, brick, steel, branch market, plain found., 18,000 sq.ft. floor space, Taunton Ave, $150,000. C. W. Swanson, 21 High St., Pawtucket, arch. Noted Aug. 20.

R. I., Providence—FIRE STATION—City, P. Buildings Dpt., soon takes bids 2 story, basement, brick, concrete, steel, plain found., Reservoir Ave. and Roger Williams Park. $150,000. T. J. H. Pierce, City Hall, archt. Noted May 28.

CONTRACTS AWARDED

Mass., Greenfield—COURT HOUSE—Franklin Co. Comn., H. E. Adams, secy. 3 story, basement, 65 x 130 ft. and 65 x 95 ft., brick, stone, to George R. Reed & Co., 24 Franklin St., $250,845; plumbing and heating to J. B. Kennedy Co., Greenfield, $11,970 and $34,865 respectively. Grand total $297,680. Noted Aug. 20.

Minn., Rochester—CITY HALL—City, general contract, 2 story, basement, brick, steel, rein.-con., to G. Schwartz & Co., Rochester. Est. $180,000. Noted Aug. 19.

Neb., Lincoln—MUNICIPAL—City Council, T. H. Berg, city clk., 3 story, 93 x 195 ft., rein.-con., brick, stone, to Olson Constr. Co., 704 Stuart St., $150,000. Noted Aug. 5.

UNCLASSIFIED

PROPOSED WORK

Ind., Indianapolis — WAR MEMORIAL — Trustees Indiana World War Memorial, American Legion Bldg., 777 North Meridian St., soon takes new bids finishing interior main building war memorial. Former bids rejected. Total est. $1,000,000. Walker & Weeks, 2341 Carnegie Ave., Cleveland, O., archts., Noted Aug. 14.

N. Y., New York—ACADEMY—Academy of Medicine, 5th Ave. and 103rd St. plans by York & Sawyer, 100 East 42nd St., 6 story, basement, brick, steel addition, $300,000.

CONTRACTS AWARDED

Ind., Indianapolis — WAR MEMORIAL — Trustees Indiana World War Memorial, American Legion Bldg., 777 North Meridian St., M. A. Sonntag, pres., granite construction war memorial, cenotaph, to Albert M. Higley Co., 2036 East 22nd St., Cleveland, O., $55,000. Noted Aug. 14.

Mass., Boston—HOME—Home for Aged Women, South Huntington Ave., 6 story, basement, 40 x 90 ft., brick, steel annex, plain found., South Huntington Ave. and Jamaica Way, to C. S. Cunningham & Sons Constr. Co., Statler Bldg. Est. $150,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., San Francisco—ICE PLANT—St. Francis Ice Co., c/o C. S. Plant, 1201 California St., expending $100,000, reconstruction, installing equipment, 10th and Bryant Sts. $100,000. Architect not appointed.

Del., New Castle—STEEL PLANT—International Pipe & Mining Co., 122 East 42nd St., New York, reconstructing plant, equipment, $1,000,000. Project in abeyance. **Maturity about Dec. 1.** Noted Apr. 30.

Mass., Boston — ICE MANUFACTURING PLANT — City Ice & Fuel Co., 6611 Euclid Ave., Cleveland, O., addition to ice manufacturing and storage plant. $70,000.

N. J., Elizabeth—PLANT—Schonwalter Tallow Co., Woodruff Lane, reconstructing tallow plant, recently destroyed by fire. $50,000. **Maturity indefinite.**

N. J., Jersey City—ICE PLANT—Owner, c/o C. Ziegler, archt., 26 Journal Sq., 1 story, basement, brick, steel plant. $40,000.

Constr. News page 106

N. Y., Bolivar—REFINERY—Allegheny Refineries, Inc., refinery. $250,000. Project in abeyance until December. H. Ross, Warren, Pa., engr. Noted Sept. 3.

S. C., Rock Hill—DYE HOUSE—Rock Hill Hosiery Co. (lessee), dye house, $40,000 incl. equipment.

Tex., Borger—REFINERY—Phillips Petroleum Co., Bartlesville, Okla., rebuilding refinery, recently destroyed by fire. $75,000.

Va., Hopewell—FACTORY—Restwell Mattress Co., J. E. Leggan in charge, Norfolk and Portsmouth, sketches factory. $40,000. **Maturity indefinite.**

Wis., Johnson Creek—PLANT—United Milk Products Co., J. Harris, mgr., Elkhorn, 1 story, brick, rein.-con. waste treating plant, plain found. J. Donohue Eng. Co., Sheyboygan, engrs.

BIDS ASKED

Ind., Columbia City—FACTORY—Sept. 15, by Globe-Superior Co., 2 story, basement, 80 x 200 ft., brick, steel. $45,000. L. Bradley, 1221 West Wayne St., Ft. Wayne, engr.

Mass., Gloucester — LAUNDRY — J. Connor, Burnham St., taking bids 2 story, brick, steel, plain found., Burnham St. $40,000. W. H. Hunt & Sons, and J. H. Arvilla, 208 Essex St., Salem, archts.

N. J., Allenwood—PLANT—Sept. 14, by Ballinger Co., engrs. and archts., 12th and Chestnut Sts., Phila., Pa., bids about Sept. 15, general contract altering 2 story, basement, brick, steel, for American Colortype Co., 207 West 25th St., New York. $40,000. Noted Aug. 12.

Pa., Phila.—CIGAR FACTORY—J. S. Simsohn, archt., 933 North Broad St., taking bids general contract, 6 story, basement, 11th and Wharton Sts., for Consolidated Cigar Co., 619 Moore St., Phila., and 730 5th Ave., New York. To exceed $100,000. Noted Sept. 3.

CONTRACTS AWARDED

Mass., Cambridge—FACTORY—National Biscuit Co., 129 Franklin St., altering and constructing 3 story, brick, addition, to H. L. Hayser Building Co., 31 Bay St., Dorchester. Est. $40,000.

Mass., Woburn—MANUFACTURING—Atlantic Gelatin Co., Inc., J. H. Cohen, Hill St., two 1 story, 30 x 145 ft. brick, timber manufacturing buildings, concrete founds., to L. Leroy Fox, Inc., 101 Milk St., Boston. Est. $50,000.

Mo., St. Louis—PUBLISHING PLANT—Christian Bd. Publications, 2700 Pine St., 3 story, basement, rein.-con., brick, stone, Pine and Beaumont Sts., to Humes-Deal Co., Arcade Bldg. Est. $100,000.

O., Girard — LEATHER PLANT — Ohio Leather Co., leather plant addition, to Heller Bros., Thurman and Furnace Sts., Youngstown. Est. exceeds $40,000, incl. equipment. Noted Aug. 27.

Pa., Ambridge—PIPE MILL—Spang Chalfont & Co., Clark Bldg., 1 story, 125 x 500 ft., mill adjacent to present building, to Amer. Bridge Co., Frick Bldg. Noted Aug. 20.

Wis., Manitowoc—PLANT—Aluminum Specialty Co., 17th and Wallmer St., 3 story, 45 x 60 ft., brick, rein.-con., 17th St., to Kasper Constr. Co., 4 North 8th St., Manitowoc.

Wis., Menasha—PLANT—Marathon Paper Mills Co., 1 story, brick, concrete, rein.-con. plant, to Fluor Bros. Constr. Co., 48 Otter St., Oshkosh. Est. $40,000.

GARAGES

PROPOSED WORK

Mass., New Bedford—M. C. Austin, 15 Chestnut St., revised plans by J. McIntyre, 908 Purchase St., 1 story, concrete garage, workshop, Mall and Chestnut Sts. $40,000. Former bids rejected.

N. J., Union City—Owner, c/o J. G. Helmers, archt., 147 Summit Ave., will not build 2 story, basement, brick, steel garage, 14th St. $150,000. Project abandoned. Noted Aug. 27.

N. Y., New York—G. W. Plunket, 205 East 85th St., plans by R. J. Marx, 3980 White Plains Ave., altering 3 story stable to service garage, 505 East 116th St. $45,000.

N. D., Dunseith — San Haven Sanitarium, J. G. La Mont, supt., soon takes bids 3 story, 40 x 60 ft. garage and laundry building, $35,000. Bugenhagan & Molander, 305 Union Natl. Bank Annex, Minot, archts.

Pa., Pittsburgh—See "Warehouses."

CONTRACTS AWARDED

Mass., Brighton (sta. Boston)—City of Boston, Dpt. P. Buildings, 1 story, concrete garage at Police Station 14, to R. J. Connolly, 1146 Dorchester Ave., Dorchester. Est. $40,000. Noted Sept. 3.

Mass., Nantucket—J. M. Cadrain, 7 Middle Pearl St., 1 story, 90 x 100 ft., concrete, steel public service and repair garage and showroom, concrete found., to J. C. Ring, Nantucket. Est. $45,000. Noted Mar. 26.

Minn., Minneapolis—East Side Tire & Supply Co., E. J. Loring, secy., 423 Central Ave., 1 story, L shaped, 30 x 50 ft. and 28 x 32 ft., repair and service station, to W. A. South Co., 219 South 9th St.

SHOPS AND FOUNDRIES

CONTRACTS AWARDED

Wis., Eau Claire—MACHINE SHOP—Johnson Machine Wks., 101 Menomonie St., 1 story, 30 x 32 ft., addition, to Hoeppner-Bartlett Co., 501 S.A.F. Bldg.

POWER PLANTS

PROPOSED WORK

Calif., Los Angeles—City Water & Light Dpt., (3rd unit) Power Plant 2, in San Francisquito Canyon north of Saugus, incl. additional steel penstock providing 18,000 hp. generating capacity conditioning tunnels between Power Plants 1 and 2. $1,000,000. H. A. Van Norman, ch. engr.

Ind., South Bend — Notre Dame University soon takes bids rein.-con. brick power plant addition, on campus. $65,000. Albert Kahn, Inc., Marquette Bldg., Detroit, Mich., archts. Noted July 9.

BIDS ASKED

N. Y., New York—Sept. 14, by J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., altering and boiler house additions, installing new boilers to City Home District, Welfare Island. Former bids rejected. Noted July 30.

CONTRACTS AWARDED

Miss., Starkville—City, c/o City Clerk, municipal light plant, 6 mi. street lighting, to Fairbanks-Morse Co., 1000 St. Charles St., New Orleans, La., $101,682. Noted May 14.

O., Ashtabula—Ashtabula General Hospital, 1 and 2 story, brick, steel, concrete power plant, laundry, to A. J. Slaybaugh, McGovern St. Est. $40,000.

WAREHOUSES

PROPOSED WORK

Ill., Chicago—Pushman Bros., 16 South Wabash Ave., sketches 1 story, rug storage display and service building, 37th Pl. and Michigan Ave. $40,000.

N. J., Jersey City—Culbert Pipe & Fittings Co., 170 8th St., 1 story, basement, 150 x 200 ft., brick, steel warehouse, Tonnele Ave. $150,000. Project in abeyance. Mahnken & Schultz, 26 Journal Sq., archts. Noted Aug. 20.

N. J., Newark—Wilkinson Gaddis & Co., 95 Parkhurst St., 5 story, basement, brick, steel grocery warehouse, office. $500,000. **Maturity indefinite.**

N. Y., Flushing—New York & Queens Electric Light & Power Co., 28-19 Bridge Plaza, Long Island City, rein.-con. storage, Roosevelt Ave. and Lawrence St. $40,000 incl. equipment.

N. Y., New York—New York State Realty & Terminal Co., c/o New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., plans by J. B. Snook Sons, 52 Vesey St., 7 story, 81 x 163 ft. warehouse, 82 Gansvoort St., 89 Horatio St. and 802 Washington St.

N. Y., Utica—Fonda Container Co., 2150 Erie St., warehouse. To exceed $40,000.

Pa., Pittsburgh—Baninger Co., archts. and engrs., 105 South 12th St., Phila., soon takes bids 3 story, 70 x 100 ft. warehouse and office 1 story, 21 x 41 ft. garage, brick, steel, concrete pile founds., Carson St., for Norton Co., O. Anderson, mgr., 338 3rd Ave.

BIDS ASKED

N. J., Irvington—N. J. Convery, archt., 32 Walnut St., Newark, taking bids 2 story, basement, 50 x 200 ft., brick, steel, rein.-con. warehouse, Lyons Ave., for Oowner, c/o architect. $150,000.

CONTRACTS AWARDED

Kan., Topeka—Santa Fe Impvt. Co., rein.-con., steel brick wholesale grocery warehouse, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $200,000.

Mass., Cambridge — C. W. Stone Co., 412 Broad St., Lynn, 1 story, 200 x 300 ft., brick, steel, parcel distributing station and garage, plain found., Charles, Bent and 2nd Sts., to W. M. Bailey Co., 88 Broad St., to Boston. Est. $150,000.

Mass., Salem—North Shore Waste Paper Co., 69 St. Peter St., 1 story, concrete storage building extension, to Parker & Walsh, 119 Webb St. Est. $40,000.

O., Toledo—International Harvester Co., 606 South Michigan Ave., Chicago, Ill., 2 story storage and truck service, to A. Bentley & Son, 201 Belmont Ave. Est. exceeds $150,000.

Ont. Toronto—One Hundred Seventeen Peter St. Corp., general contract 3 story, basement, rein.-con., stone warehouse and manufacturing building, Peter St., to Yolles & Rotenberg, 372 Bay St., Toronto; excavation, to Dufferin Constr. Co., foot of Bathurst St. Est. $200,000.

See proposal advertising on page 81